

STUDIES IN THE MEDICINE OF ANCIENT INDIA

PART I

OSTEOLOGY OR THE BONES OF THE HUMAN BODY

BY

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PREFACE

OUR knowledge of the Medicine known to the ancient Indians is at present extremely limited. I was made painfully aware of this fact in the course of preparing my edition of the two old Indian medical tracts preserved in the well-known Bower Manuscript of the fifth century A D. The exigencies of that edition led me to a closer study of Indian Medicine, and the present treatise on its osteological doctrines is one of the firstfruits of that study.

Probably it will come as a surprise to many, as it did to myself, to discover the amount of anatomical knowledge which is disclosed in the works of the earliest medical writers of India. Its extent and accuracy are surprising, when we allow for their early age—probably the sixth century before Christ—and their peculiar methods of definition. In these circumstances the interesting question of the relation of the Medicine of the Indians to that of the Greeks naturally suggests itself. The possibility, at least, of a dependence of either on the other cannot well be denied, when we know as an historical fact that two Greek physicians, Ktesias, about 400 B C, and Magasthenes about 300 B C, visited, or resided in, Northern India.

No satisfactory knowledge of human anatomy can be attained without recourse to human dissection. Of the practice of such dissection in ancient India we have direct proof in the medical compendium of Suśruta, and it is indirectly confirmed by the statements of Charaka. It is worthy of note, however, that in the writings of neither of these two oldest Indian medical writers is there any indication of the practice of animal dissection¹. Whatever

¹ The only mention of an animal subject is in connexion with training in surgery. Thus 'puncturing' is to be practised by the medical pupil 'on the veins of dead animals and on the stalks of the water-lily', similarly, 'extracting,' on the pulp of various kinds of fruit and 'on the teeth of dead animals'.

knowledge of the structure of the human body they possessed would seem to have been derived by them from the dissection of human subjects. And, whether or not cases of such dissection were frequent, their surprising proficiency in osteology argues a considerable familiarity with the bones of the human body. As to the Greeks there is indubitable evidence that an extensive practice of human dissection, on dead, and even on living subjects, prevailed in the Alexandrian schools of Herophilos and Erasistratos in the earlier part of the third century B C. But their knowledge of anatomy appears in some particulars, such as the nervous and vascular systems, so much in advance of that of the early Indians, that, if there was any borrowing on the part of the latter from the Greeks, it must have taken place at a very much earlier period, in the time of Hippokrates and his immediate followers—that is to say, in the second half of the fifth century B C.

This conclusion is confirmed by the chronological indications, no doubt more or less vague, given to us by the Indian tradition which places the earliest Indian medical schools of Ātreya and Suśruta at some time in the sixth century B C, a date supported by the Vedas. This being so, and considering that we have no direct evidence of the practice of human dissection in the Hippokratic school, but know of the visit, about 400 B C, of Ktesias to India, the alternative conclusion of a dependence of Greek anatomy on that of India cannot be simply put aside. On the other hand, there is some indirect evidence that the Hippokraties were not entirely unfamiliar with human dissection¹, and once admitting the practice of such dissection among both the early Greeks and the early Indians, the general similarity of standard in their knowledge of human anatomy may well be conceived without the hypothesis of an interdependence. In order to be able to verify a dependence of either upon the other, we require the evidence of agreement in points which are both peculiar and essential in the respective systems. It

¹ On this and other points touching Greek anatomy, see Dr. Puschmann's *History of Medical Education*.

is, in part at least, with this object that the present essay on the osteology of the ancient Indians has been prepared. It presents the Indian side of the evidence with respect to that particular department of anatomy. The Greek side of it yet remains to be exhibited, and in the absence of it, as well as of my competence for the task, I have entirely abstained from complicating my subject with references to any ancient osteology other than Indian, lest the presentment of the latter should be unduly biased.

I am tempted, however, to offer one or two passing observations. No summary of osteological doctrine, such as we find in the writings of Charaka and Suśruta, appears to exist in any of the known works of the earlier Greek medical schools. If this is the case—and I am writing under correction—it greatly adds to the difficulty of making any satisfactory comparison. There exists, however, a somewhat similar osteological summary in the Talmud (see the Note, p viii), and as the Talmudic anatomy is admittedly based on the anatomy of the Greeks, the summary in question may perhaps be taken to reflect the contemporary Greek doctrine on the subject. It is ascribed to the first century A D, but certain points in it, such as the inclusion of ‘processes’ and cartilages to make up its total of 248 bones, seem to point to its being rather a survival of the system of the Hippocratic school. In any case, however, in its method and details of classification it differs materially from the Indian, and if it may be taken in any way as a representative of Greek doctrine, it is difficult to believe in any connexion of the latter with the Indian. In this connexion a statement of Celsus, who is a fair exponent of the Greek osteology of the first century B C, may be noted. Referring to the carpus and tarsus, he says that they ‘consist of many minute bones, the number of which is uncertain’, but that they present ‘the appearance of a single, interiorly concave, bone’, and with reference to the fingers and toes, he says that ‘from the five metacarpals the digits take their origin, each consisting of three bones of similar configuration’ (beginning of Book VIII). In the latter enumeration of fifteen joints in the hands and feet, Greek osteology

agrees with the Talmudic and Indian As to the carpus and tarsus, the two views of 'a number of small bones' and of 'a single bone' are also found in the Indian osteological summaries of Suśruta and Charaka respectively, the Talmudic summary implies a reckoning of eight small bones

Another object of the present treatise is to vindicate the true form of the osteological summaries of Charaka and Suśruta The former is at present in imminent peril of total displacement and oblivion in favour of a well-meant but very ill-considered substitute, to which the otherwise meritorious first edition of Charaka's Compendium by Gangādhara has given general currency But in this matter Indian medical history is only repeating itself For, many centuries ago, the same misfortune overtook the osteological summary of Suśruta, the true form of which is now totally lost from all manuscripts owing to its supersession by a falsified substitute which gained general acceptance through the great authority, apparently, of Vāgbhata I, who once held a position in India somewhat analogous to that of Galen in the mediaeval medicine of the West At a very early period in the history of Indian Medicine, owing to the ascendancy of Neo-brahmanism, which abhorred all contact with the dead, the practice and knowledge of anatomy very rapidly declined, and concurrently anatomical manuscript texts fell into great disorder Attempts were made from time to time to restore and edit such corrupt texts, but divorced from and uncontrolled by practical knowledge of anatomy, they could not but prove unsatisfactory The earliest example of such an attempt which has survived is what I have called the Non-medical Version of the summary of the osteological system of Ātreya, which may be referred to the middle of the fourth century A D A more conspicuous example is the falsification of Suśruta's osteological summary, under the authority of Vāgbhata I, probably in the early part of the seventh century A D

The latest example is presented in Gangādhara's invention, not quite thirty years ago, of what professes to be the osteological summary of Charaka In this last-mentioned case, owing to the modernity of the substitute, it is not difficult, by an appeal

to the consensus of still existing manuscripts, to expose and prove its baselessness. But that remedy is not available in the case of the osteological summary of Suśruta, the genuine form of which has now disappeared from all available manuscripts, and can be recovered only by a laborious application of textual criticism combined with an appeal to practical anatomy. But what has occurred in the case of the osteological summaries may have happened also to other parts of the ancient Indian texts concerned with anatomy and surgery. These texts require careful scrutiny before they can be trustfully accepted and cited as evidence. The present dissertation is offered as a first example of such an investigation. Of its success I must leave others to judge, only hoping that it may induce more competent hands than mine to take up and continue the inquiry.

It only remains for me to offer my cordial thanks to the scholars who have given me their help in various ways to Dr W Osler, Regius Professor of Medicine, who gave his valuable support to the publication of my monograph by the Delegates of the University Press, to Dr Arthur Thomson, Professor of Human Anatomy, who most kindly gave me the benefit of his skilled judgement on several difficult points, to Dr P Cordier, of the French Colonial Medical Service, to whose letters and publications I owe several useful hints, but especially to Dr J Jolly, Professor of Sanskrit and Comparative Philology in the University of Wurzburg, and Dr Hamilton Osgood, of Boston, formerly Lecturer at Jefferson College, Philadelphia, U S A,¹ who both did me the favour of carefully reading the whole of my manuscript, and supplying me with some valuable corrections and suggestions in the Text-critical and Anatomical Sections respectively. My thanks are due also to the authorities of the India Office for their liberality in granting a subvention towards the cost of publication. For most of the illustrations in the Text I am indebted

¹ His lamented death occurred on the 10th July, 1907, while these pages were passing through the Press

to the skilful hand of my son. A few of them are borrowed, by permission, from Professor A. Thomson's *Handbook of Anatomy for Art-Students*. The execution of the whole is another example of the well-known high standard of the work of the Clarendon Press.

A F R H

OXFORD JULY, 1907

NOTE

THE Talmudic osteological summary, referred to on p. v, is given in the *Jewish Encyclopedia*, s. v. *Anatomy*, as follows:

'The Rabbis declared that there were 248 members (bones) in the human body, namely, 40 in the tarsal region and the foot ($30 + 10 = 40$), 2 in the leg (the tibia and fibula), 6 in the knee (including the head of the femur and the epiphyses of the tibia and fibula), 3 in the pelvis (ilium, ischium, and pubes), 11 ribs (the 12th rib, owing to its diminutive size, was not counted), 30 in the hand (the carpal bones and the phalanges), 2 in the forearm (radius and ulna), 2 in the elbow (the olecranon and the head of the radius), 1 in the arm (humerus), 4 in the shoulder (clavicle, scapula, coracoid process, and acromion)—which makes 101 for each side, or 202 for both, 18 vertebrae, 9 in the head (cranium and face), 8 in the neck (7 vertebral, and the os hyoides), 5 around the openings [*sic*] of the body (cartilaginous bones), and 6 in the key of the heart (the sternum)' (OH I 8)

The identifications within brackets appear to be those of the writer of the article on Anatomy. Dr. Bergel, in his *Studien über die naturwissenschaftlichen Kenntnisse der Talmudisten*, hesitatingly identifies the last two items as genitals and cardiac appendices (*Herzanhang*, appendix auricularis?). The identifications that I would suggest may be seen from the subjoined tabular statement.

The Talmudic osteology does not, like the Indian, divide the body into three, but into two parts, namely, (1) the trunk, inclusive of the four extremities, and (2) the neck and head. The trunk, again, is divided, (1) sagittally, into the two sides, right and left, and (2) coronally, into the back and the front. Hence arises the subjoined scheme.

NOTE

I TRUNK AND EXTREMITIES

A The Two Sides

1 Lower Limb

<i>a</i> phalanges	15	} 40 (foot, tarsals)
<i>b</i> metatarsals	5	
<i>c</i> tarsals	8	
<i>d</i> malleoli	2	
<i>e</i> unidentified	10	
<i>f</i> leg (tibia, fibula)	2	(leg)
<i>g</i> patella	1	} 6 (knee)
<i>h</i> inner and outer tuberosities	4	
<i>i</i> femur	1	
<i>k</i> ilium	1	} 3 (pelvis)
<i>l</i> ischium	1	
<i>m</i> pubes	1	

2 Middle

ribs	11	(ribs)
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3 Upper Limb

<i>a</i> scapula	1	} 4 (shoulder)
<i>b</i> clavicle	1	
<i>c</i> acromion process	1	
<i>d</i> coracoid process	1	
<i>e</i> humerus	1	(humerus)
<i>f</i> olecranon process	1	} 2 (elbow)
<i>g</i> capitellum of humerus	1	
<i>h</i> radius and ulna	2	(forearm)
<i>i</i> styloid processes	2	} 30 (hand)
<i>k</i> carpals	8	
<i>l</i> metacarpals	5	
<i>m</i> phalanges	15	

Total

$$101 \times 2 = 202$$

B Back, or spinal column (exc cervix)

<i>a</i> dorsal vertebrae	12	} 18 (vertebrae)
<i>b</i> lumbar vertebrae	5	
<i>c</i> sacrum, coccyx	1	

C Front, or breast

<i>a</i> sternum and	}	6 (key of heart)
<i>b</i> costal cartilages		

Total of Trunk and Extremities

Brought forward

226

II HEAD AND NECK

A Head

1 Cranium

<i>a</i> frontal bones	2	} 9 (head)
<i>b</i> parietal bones	2	
<i>c</i> occipital bone	1	
<i>d</i> temporal bones	2	
<i>e</i> malar bones	2	

2 Openings

<i>a</i> mouth (maxillaries)	2	} 5 (openings)
<i>b</i> ear (pinna)	2	
<i>c</i> nose (cartilage)	1	

B Neck

<i>a</i> vertebrae	7	} 8 (neck)
<i>b</i> windpipe	1	

Total of Head and Neck	<u>22</u>
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Grand total of Skeleton	<u><u>248</u></u>
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STUDIES IN THE MEDICINE OF ANCIENT INDIA

PART I

THE BONES OF THE HUMAN BODY

SECTION I

INTRODUCTION MEDICAL SCHOOLS, CHRONOLOGY

§ 1 *Explanation of Terms Medical Authors, and their Works*

1 THE theory of the Ancient Indians regarding the skeleton, or the bony frame of the human body, has been transmitted to us in three different systems. These are the systems of Ātreya, Suśruta, and Vāgbhata.

2 *Ātreya, the Physician* Ātreya was not so much a surgeon as a physician. He is said to have had six pupils, and his teaching of medicine is said to have been committed to writing by all six in the form of a *Samhitā*, or Compendium. It may, therefore, antecedently, be expected that we shall find then six medical compendia to agree in all essential points. At present, however, no more than two of them are known to us. These are the Compendia of Agniveśa and Bheda (or Bhela).

3 *Charaka and Drdhabala* As to the latter, the *Bheda Samhitā*, we know, at present, of the existence of but a single manuscript (§ 12). The former, the *Agniveśa Samhitā*, has had a changeful history. In its original form it has not survived, though it appears to have still existed in the eleventh century when the commentator Chakrapāni-

datta (§ 2, cl 11) quotes it¹ At present it exists only in a redaction undertaken, at a much later date, by a Kashmiri physician, called Charaka He, however, appears never to have completed it Possibly death may have intervened In any case, the concluding portion of the redaction, about one-third of the whole work, was supplied, several centuries afterwards, by another Kashmiri physician Dridhabala, the son of the physician Kapilabala The entire compendium consists of eight sections (*sthāna*) The portion contributed by Dridhabala comprises, as we know from the same Chakrapānidatta,² the last seventeen chapters of the sixth, and the whole of the seventh and eighth sections In the preparation of this portion, Dridhabala, as he himself informs us,³ utilized a large number of existing treatises Among these may have been Agniveśa's original Compendium, but his main sources, as a comparison of their respective works shows, appear to have been the *Astāṅga Samgraha*, or Summary of Medicine, of Vāgbhata I, and the *Nidāna*, or Pathology, of Mādhava But Dridhabala did not limit himself to his complementary task he also revised the portion written by Charaka himself He was, as he himself informs us in a passage at the end of the eighth section,⁴ a native of a settlement (*pura*), called Panchanada, i e five-stream-land In India the confluence of streams is apt to be treated as a sacred place of pilgrimage (*tīrtha*), and there are there several such places called Panchanada Anciently one of them appears to have existed in Kashmir, near the confluence of the rivers Jhelam (*Vitastā*) and Sindhu Its place is indicated by the modern village of Pantzinōi (lit five channels), which lies close to what was the original site of that confluence, before its removal to its present site, in the latter half of the ninth

¹ e g in his glosses on the Treatment of Fever (*Jvara-cikitsā*), Tübingen MS, No 463, fol 356 a, l 1

² *Ibid*, fol 534 b

³ See *Charaka Samhitā*, ed Jivānanda Vidyāsagarīa (1896), p 827

⁴ The passage is omitted in Jivānanda's edition of 1877, apparently by some accident It is given in the edition of 1896, p 930, ver 78, also in the edition of Gangādhari, p 90, as well as in the edition of the two Sen, p 1055 Its genuineness is attested by Chakrapānidatta's commentary, Tübingen MS, No 463, fol 639 a, l 2

century, in the reign of King Avantivaṃśa. It is this Kashmirian Panchanada, which probably was the home of Dṛidhabala.¹ The early commentators of the eleventh and thirteenth centuries (e.g. Chakrapāṇidatta and Vijaya Rakṣita) often refer to a Kashmirian Recension (*Kāśmīra pāṭha*) when commenting on passages of the earlier portion of the Compendium, i.e. the portion written by Charaka himself.² The probability is that in all these cases the reference is to Dṛidhabala's Revision of Charaka's work, for in references to the concluding portion of the Compendium, Dṛidhabala, as a rule, is quoted by name as its author.³ It seems clear from their method of quotation that the medical writers of that period were fully aware of the exact share which Dṛidhabala had in Charaka's redaction of Agniveśa's original Compendium. At a still earlier period, Mādhava, when he quotes Charaka's redaction in his *Nīdāna*, or Pathology, shows no acquaintance with the revised version of it made by Dṛidhabala. At the present day the latter's share

¹ See Dr Stein's Translation of the *Rājataranginī*, ch. iv, 248, v, 66 ff, also his account of the removal of the confluence, vol. II, pp. 239 ff, 419 ff. The usual identification of Panchanada with the Panjab is untenable, for Dṛidhabala clearly indicates a locality (*pura*), not a country, as his home. Dr Cordier, in his *Récents Découvertes*, identifies it with 'Panjpur au nord d'Attock, Pañjab', on the authority, as he has informed me privately (letter of January 13, 1905), of 'an Indian Nāgī map lithographed in Benares' and of 'the Indian Post-Office Guide'. I am afraid he has been misled by his authorities. Dr Stein, whom I asked to verify on the spot, writes to me (letter of March 1, 1905) that there is no Panjpur in the region of Attock, nor in 'the latest edition of the Indian Postal Guide'. There is, however, an isolated ridge known as Panjpīr, or 'Hill of the Five Pīrs', in the Yusufzai Plain, NNW of Attock, a Muhammadan place of pilgrimage. This appears to have caused the confusion, but between Panjpīr and Panchanadapur there can obviously be no connexion. See also my article on 'the Authorship of the Charaka Samhitā' in the *Archiv für die Geschichte der Medizin*, 1907.

² e.g. Chakrapāṇidatta, on *Jvara-cikitsā*, in Jīv ed (1896), pp. 455, 456, or Tübingen MS, No. 463, fol. 348 a, l. 7 and fol. 348 b, l. 2. Also Vijaya Rakṣita, on *idem*, Jīv ed, pp. 453-4, in *Madhukosa*, Jīv ed, p. 29, also on *Arśaś-cikitsā*, Jīv ed, p. 549 (or ed. 1877, p. 574), in *Madhukosa*, p. 71, again on *Yakṣma-cikitsā*, Jīv ed, p. 522, in *Madhukosa*, p. 95.

³ e.g. by Chakrapāṇidatta, in *Sūtra Śhāna*, ed. Haimath Visarad, p. 123. Also by Vijaya Rakṣita, in *Madhukosa*, Jīv ed, pp. 84, 120, 124, 147, 152, 162, 179, 180.

in the redaction of Charaka is practically forgotten in India, and the whole work is there known simply as Charaka's Compendium (*Charaka Samhitā*). In the present dissertation it will always (unless otherwise specified) be referred to under that name. For all practical purposes it may be understood that Charaka's Compendium represents Ātreya's system of medicine, as handed down by his pupil Agniveśa. At all events, this is certain in respect of the passages relating to the bones of the human body. For these passages are contained within that portion of the Compendium which is the production of Charaka himself, and the existence as early as the sixth century B C, of the osteological system contained in them, is guaranteed by references to it in the *Satapatha Brāhmaṇa*, a Vedic work of that age (§ 42).

4 *Versions of Ātreya's System* Of Ātreya's theory of the skeleton, then, we possess two versions—one by Agniveśa, contained in Charaka's Compendium, the other by Bheda (or Bhela), contained in Bheda's Compendium. In the present dissertations these two versions will be spoken of as the 'Medical Version' of Ātreya's theory. There exists, however, also another version of that theory, which has been handed down in the ancient Law-book of Yājñavalkya (*Yājñavalkya Dharmaśāstra*), and three other non-medical works (§ 14). This version, in the following pages, will be referred to as the 'Non-medical Version'. By this term, unless otherwise specified, Yājñavalkya's Law-book must always be understood, as being the most reliable source of that version. It will be shown subsequently (§ 24) that there is some good reason for believing that this Non-medical Version really represents a third medical version of Ātreya's theory, going back to another pupil of Ātreya, different from Agniveśa and Bheda, but whose name is no longer known.

5 *Suśruta, the Surgeon* In contrast with Ātreya, the physician, Suśruta was a surgeon. While the former professed general medicine (*Āyurveda*, or the Science of life), the latter made surgery (*Śalya*) his special study. Suśruta, likewise, wrote a Compendium (*Samhitā*) of General Medicine (*Āyurveda*), but, agreeably with his profession, its main concern was with surgical matters. It thus treats of some subjects, such as surgical instruments, which are

not noticed at all in the Compendium of Charaka¹ Moreover, it omits all mention of some diseases in the treatment of which surgery, at that time, did not enter For this reason, from the point of view of general medicine, Suśruta's Compendium, of course, had the appearance of incompleteness Hence after some time (§ 2 cl 5), an anonymous writer composed a Supplement (*Uttara-tantra*) which treated of all the subjects unnoticed by Suśruta Among the latter were even subjects belonging to minor surgery (*Sālākya*), which circumstance shows that, for example, the surgical treatment of some eye-diseases (as cataract, &c) was still unknown in the time of Suśruta At the present day the whole work, inclusive of the Supplement, is known simply as Suśruta's Compendium (*Suśruta Samhitā*), and in the present dissertation (unless otherwise specified) it will be quoted under that name In order to distinguish, however, Suśruta the Supplementor, or Suśruta II, from the original Suśruta, the latter is sometimes designated by Indian commentators 'Suśruta the elder' (*vrddha Suśruta*) For our present purpose it is important to notice that the passages relating to the bones of the human body occur in the original work of Suśruta the elder At the same time, it is quite possible that the Supplementor, in addition to his proper task, may have subjected the original portion of the compendium to some amount of revision But from indications in the before-mentioned *Satapatha Brāhmaṇa* (§ 42), it is not probable that this occurred in the case of the passages in question

¹ Suśruta devotes two whole chapters (the seventh and eighth of the *Sūtra Sthāna*) to the description of surgical instruments, and one whole chapter (the twenty-fifth) to the principles of surgical operation Charaka appears to speak of surgical operations in two places of his Compendium The operation of laparotomy is described in the *Cikitsita Sthāna*, ch xviii, verses 179 ff (Jiv ed, p 653), and an operation for the extraction of a dead foetus is briefly mentioned in a clause of the *Sārira Sthāna*, ch viii, § 64 (p 364) In neither of these cases, however, is any surgical instrument named Moreover, chapter xviii (on *Udara*) was not written by Charaka at all, but by Dṛdhabala, who extracted his information from Suśruta's Compendium (*Cik Sth*, xiv, pp 454-5), where the appropriate instrument (*vrīḥmukha*, a kind of trocar) is named, and the clause in chapter viii is probably a similar interpolation of the same Dṛdhabala

6 *Vāgbhata I* Vāgbhata knew both Compendia, of Charaka and of Suśruta. He refers to both these medical writers by name, and quotes, or at least utilizes, then works. In his time Charaka's Compendium was still incomplete, but Suśruta's Compendium had already received its Supplement. This is particularly shown by Vāgbhata's treatment of the diseases of the eye, which are dealt with in Suśruta's Supplement, while in Charaka's incomplete work they are not described at all. Vāgbhata wrote a Compendium on General Medicine, which, on the model of the Supplemented Compendium of Suśruta, he divided into six sections (*sthāna*),¹ and to which he gave the name of Summary of the Octopartite Science (*Aṣṭāṅga Samgraha*).² The name indicates Vāgbhata's object. It was to gather up into a harmonious whole the more or less conflicting medical systems current in his time, especially those contained in the Compendia of Charaka and Suśruta. In pursuance of this object he introduced, especially with reference to the diseases of the eye, many modifications in the classification and nomenclature which had hitherto been accepted in medicine. It also led him to the adoption of compromises—by no means always successful—of which, as the present dissertation will show, his exposition of the skeleton presents a conspicuous example.

7 *Vāgbhata II* On the basis of Vāgbhata's Summary a much later namesake of his, whom I shall designate Vāgbhata II, wrote a new work, in the name of which a return is made to the

¹ The concluding section is called *Uttara Sthāna* in Vāgbhata's Summary, but *Uttara Tantra* in Suśruta's Compendium. The latter consists of five *Sthāna* and an *Uttara-tantra*, while the former is made up of six *Sthāna*. The difference in the nomenclature is significant. Suśruta's original work consisted of only five sections (*sthāna*), to which, at a later date, a supplementary treatise (*tantra*) was added. On the other hand, the division into six sections (*sthāna*), inclusive of the supplementary treatise, was first devised by Vāgbhata for his own work.

² Indian Medicine is divided into eight branches: (1) Internal Medicine (*Kāya Cikitsā*), (2) Major Surgery (*Śalya*), (3) Minor Surgery (*Śālākya*), (4) Daemonology (*Bhūta-vidyā*), (5) Toxicology (*Viśa*), (6) Tonics (*Rasāyana*), (7) Aphrodisiacs (*Vrśa*), (8) Paedotrophy (*Kumāra-bhrtiya*).

older usage, by calling it the Compendium of the Essence of the Octopartite Science (*Aṣṭāṅga Hṛdaya Samhitā*) With reference to him the author of the Summary (*Samgraha*) is sometimes called, by Indian commentators, Vāgbhata the elder (*vrddha Vāgbhata*)

§ 2 Chronology

1 It will naturally be expected that some information should be given regarding the chronology of the works and their authors mentioned in the preceding paragraph Unfortunately there still exists very great uncertainty with respect to their absolute, and to some extent even to their relative, dates On a future occasion I hope to enter more fully into the discussion of the chronological question for our present purpose the following statement will suffice

2 *Origin of Medicine* According to the Indian medical tradition the knowledge of medicine had a twofold origin On the one hand, it was delivered by the god Indra to the sage Bhṛigu-dvāja, and by him to Ātreya on the other, it descended from Indra to Dhanvantari (also called Divodāsa, and Kāśīrāja), and from him to Suśruta This tradition traces medicine from a mythical, through a semi-mythical, to an historical beginning It may be taken to mean that Ātreya, the physician, and Suśruta, the surgeon, were understood to be the first founders, in their respective departments, of medicine as a science Before them there existed only what may be called medicine men, who practised medicine as a witchcraft, and the source of whose knowledge was claimed to be supernatural

3 *Ātreya and Suśruta* According to another, non-medical, line of Indian tradition, preserved in the Buddhist *Jātakas*, or Folklore, there existed in India in the age of Buddha two great universities, or seats of learning, in which 'all sciences' (*sabbasippāni*, or *sarva-śilpāni*), including medicine, were taught by 'professors of world-wide renown' (*disā-pāṃokkha ācāriya*, or *disā-prāṃukhya ācāriya*) These two universities were Kāśī, or Benares, in the East, and the still more famous *Takṣaśilā*, or Taxila (on the Jhelam river) in the West In the latter university, in the time of Buddha or shortly before it, the leading Professor of Medicine

was Ātreya¹ He, accordingly, should have flourished at some time in the sixth century B C. As one of the names of Suśruta's teacher is Kāśīnāja, which literally means King of Kāśī, he may not unreasonably be referred to the university of Kāśī, or Benares. This would place the origin of surgery, as a science, in the East of India. As a matter of fact, the origin, at least of ophthalmic surgery, is uniformly placed by Indian tradition in the eastern province of Bihar, being credited to Nemi, the 'lord of Videha' (or Tirhut). Regarding the date of Suśruta we have the following indications. He must have been acquainted with the doctrines of Ātreya. With reference, for example, to the bones of the human body, he introduces his own exposition with a remark pointing out the difference between Ātreya's system and his own in respect of the total number of the bones (see § 27). This proves that Suśruta cannot have been anterior to Ātreya. On the other hand, there are indications in the *Śatapatha Brāhmaṇa*, a secondary Vedic work, that the author of it was acquainted with the doctrines of Suśruta (see §§ 42, 56, 60, 61). The exact date of that work is not known, but it is with good reason referred to the sixth century B C (see § 42). The probability, therefore, appears to be that Suśruta was a rather younger contemporary of Ātreya, or, let us say, a contemporary of Ātreya's pupil Agniveśa.

4 *The Atharva Veda* As bearing on the very early date of both Ātreya and Suśruta, we have a rather significant piece of evidence in the *Atharva Veda*. That work, in its tenth book, contains a hymn on the creation of man (see § 43), in which the several parts of the skeleton are carefully and orderly enumerated in striking agreement more especially with the system of Ātreya as contained in Charaka's Compendium². The date of the *Atharva Veda* is not exactly known, but it belongs to the most ancient, or primary Vedic, literature of India. It cannot be placed later

¹ The famous physician Jīvaka, a contemporary of Buddha, is stated to have studied medicine in the Taxila University, under Ātreya (see Rockhill's *Life of Buddha*, pp 65, 96).

² There are numerous other passages of a similar character in the *Atharva Veda*. The whole evidence is reviewed by me in the *Journal of the Royal Asiatic Society* for 1906, p 915 ff, and for 1907, p 1 ff.

than the sixth century B.C., because references to it are found in secondary Vedic works, such as the *Satapatha Brāhmaṇa* above referred to. The larger portion of it (Books I–XVIII), indeed, admittedly belongs to a much earlier period, possibly as early as about 1000 B.C., and the hymn in question is included in this older portion. Moreover, within that portion it belongs to a division (Books VIII–XII) which bears a distinctly hieratic character. It thus takes us back to that prehistoric, or semi-mythical age of the ‘medicine men’ who combined the functions of priest and physician. This period, as already stated (clause 2), Indian tradition represents by the name of Bhāradvāja, and to him it actually ascribes the authorship of one of the hymns (the twelfth of the tenth book) of that hieratic division.¹

5 *Charaka and Nāgārjuna* According to a Buddhist tradition² Charaka was the trusted physician of the celebrated ‘Indo-scythian’ King Kanishka. Unfortunately the date of Kanishka himself is still in dispute, opinions varying from the first century B.C. to the third century A.D.³ The preponderance of evidence appears to me in favour of Kanishka’s reigning in the middle of the second century, *circa* 125–150 A.D. There exists an Indian medical tradition which assigns the revised and supplemented edition of Suśruta’s original work to Nāgārjuna.⁴ If he should be the well-known Buddhist patriarch of that name who is said to have been a contemporary of King Kanishka, his date would practically coincide with that of Charaka. Accordingly the original Compendia of Agniveśa and Suśruta would have been revised and re-edited at much the same time.

¹ On the date of the *Atharva Veda*, see pp. cxl–cxli in Professor Linman’s edition of Whitney’s Translation of the *Atharva Veda Samhitā*, also Professor Macdonell’s *Sanskrit Literature*, pp. 185–201.

² Discovered by Professor Sylvain Lévi, *Indian Antiquary*, vol. xxii, p. 382, *Vienna Oriental Journal*, vol. xi, p. 164.

³ See V. A. Smith, *Early History of India*, pp. 225–6, Dr. Fleet, in *Journal of the Royal Asiatic Society*, 1906, p. 979 ff., Mr. D. R. Bhandarkar, in *Journal of the Bombay Branch of the Royal Asiatic Society*, vol. xx, p. 269 ff.

⁴ See Dallana’s Commentary to Suśruta’s Compendium (ed. Jivānanda), p. 2, also Dr. Cordier’s *Récents Découvertes*, pp. 12, 13.

6 *Vāgbhata the Elder* Regarding the relation of Vāgbhata I to Charaka and Suśruta the elder, his posteriority is proved by his referring to both these writers by name, and sometimes even quoting their actual words¹ His relation to Suśruta II, the Supplementor, is less certain So far as known to me, he never actually quotes from him; still his Summary (*Samgraha*) presents numerous indications of a decided posteriority His treatment, e.g. of the diseases of the eye, though in its general lines agreeing with that of the Supplementor, yet in its more artificial and scholastic method of classification—Vāgbhata I counting ninety-four diseases against the seventy-six in the Supplementor's more natural system—suggests his posteriority to Suśruta II The place assigned to Vāgbhata I by later Indian Medicine, in its traditional series of the three men, Charaka, Suśruta, Vāgbhata, makes in the same direction, for there can be no doubt that, in that series, the term Suśruta refers to the Supplemented Compendium which is now known under Suśruta's name If Suśruta II is rightly placed in the second century A.D., as a contemporary of Charaka, Vāgbhata I is, of course, also posterior to him Indeed, there is good reason for placing Vāgbhata I as late as the early seventh century A.D. The Buddhist pilgrim, Itsing, who resided ten years in the Nalanda monastery (in Bihar), from about 675–685 A.D., states in his *Record of Buddhist Practices* that the 'eight arts (i.e. branches of medicine, *ante*, footnote 2, p. 6) formerly existed in eight books, but lately a man epitomized them, and made them into one bundle (or book)', and he adds that 'all physicians in the five parts of India (i.e. the whole of India) practise according to his book'² Seeing that Vāgbhata I's Compendium bears that precise name of 'Epitome (or Summary, *Samgraha*) of the Octopartite Science', the conclusion seems warranted that Itsing was referring to that Summary If so, Vāgbhata I cannot have preceded Itsing by any very long interval of time, nor may the interval be

¹ By name, e.g. in *Samgraha*, Bombay ed., vol. 1, p. 246, vol. 11, p. 421. Again quoted from Charaka, *ibid.*, vol. 1, pp. 20, 93, vol. 11, pp. 212, 213, *et passim*, from Suśruta I, *ibid.*, vol. 1, pp. 109, 121, 177, 247, vol. 11, p. 303, *et passim*.

² See Professor Takakusu's Translation, p. 128, also *Journal Royal Asiatic Soc.*, 1907, p. 413 ff.

made too short, because time was necessary for the diffusion of the Summary as a standard work 'throughout India' Accordingly Vāgbhata I may be placed early in the seventh century, or about 625 A D This estimate of his date is supported by certain structural features of his Summary, which are explained in §§ 38-40 It is, further, in agreement with the progressive decadence in the knowledge and practice of anatomy and surgery, which is apparent in the medical writings subsequent to the time of Suśruta II One of the results of the present dissertation is to bring out the contrast between the treatment of the bones of the human body in the hands of Suśruta and Vāgbhata I While that of the former exhibits a remarkable familiarity with the structure of the skeleton, the latter's treatment of the subject is so replete with inconsistencies and incongruities as to show that in the time of Vāgbhata I practical anatomy had fallen into disuse At a still later time, in the Compendium of Vāgbhata II, the information about the skeleton is limited to the bare statement that the total number of bones is 360¹ Again, the surgical treatment of certain diseases of the eye, such as cataract, which occupies a considerable space in the Supplement (*Uttara Tantra*) of Suśruta II, is much less prominent in the Summary (*Samgraha*) of Vāgbhata I, while in the subsequent writings of Mādhava, Dṛḍhabala, and Vāgbhata II it is altogether ignored The dates of the latter three authors fall somewhere, at no great intervals, in the period from the 7th-9th centuries A D, and facts, such as those just mentioned, indicate the place of Vāgbhata I to be intermediate, yet much nearer to them than to Suśruta II, and thus tend to confirm the assignment of the former to the early seventh century A D

7 *Mādhava, Dṛḍhabala, and Vāgbhata II* With regard to the chronological position of the three authors, Mādhava, Dṛḍhabala, and Vāgbhata II, two points are quite certain In the first place, all three are posterior to Vāgbhata I This, to start with, is a necessary inference from their attitude, as above explained (clause 6), towards anatomy But

¹ Contained in half a verse, *Astāngu Hrdaya, Sārīra Sthāna*, ch iii, ver 16 a (1st ed, vol 1, p 548)

there is positive proof Mādhava cites Vāgbhata I by name, and also quotes from him anonymously¹ Drīdhabala, though he does not name Vāgbhata I as his authority, quotes from him very frequently.² Also his total of ninety-six diseases of the eye is based on Vāgbhata I's total of ninety-four (see p 13) As to Vāgbhata II, according to his own statement,³ his Compendium (*Astānga Hrdaya Samhitā*) is based on the Summary (*Astānga Samgraha*) of Vāgbhata I, and reproduces it copiously In the second place, all three are anterior to Chakrapānidatta, whose date is about 1060 A D The latter names Drīdhabala, and expressly specifies the extent of his contribution to Charaka's Compendium⁴ He also frequently quotes Drīdhabala as the author of the last section (*Siddhi Sthāna*) of that Compendium⁵ As to Vāgbhata II, quotations from him, by name, are very numerous in Chakrapānidatta's Commentary on Charaka's Compendium⁶ Mādhava's anteriority to Chakrapānidatta necessarily follows from the fact of his preceding (see p 13) both Drīdhabala

¹ By name, in *Siddhayoga*, i, 27, cf *Samgraha*, vol ii, p 1, l 8 Quoted, in *Nīdāna* (ed Jiv), ii, 22, 23, cf *Samgraha*, vol i, p 266, ll 2-5

² *Caraka Samhitā* (ed Jiv, 1896), *Cikitsita Sthāna*, xvi, ver 31, p 624, cf *Samgraha*, vol ii, p 26, ll 7, 8, *ibid*, xvi, verses 53 ff, p 626, cf *Samgraha*, vol ii, p 27, ll 8 ff, *ibid*, xvi, ver 64 b, p 627, cf *Samgraha*, vol ii, p 27, l 19, *ibid*, xvi, verses 76 ff, p 628, cf *Samgraha*, vol ii, p 28, ll 20 ff, *ibid*, xvi, ver 97, p 638, cf *Samgraha*, vol ii, p 108, ll 15 ff, *et passim*

³ See *Astānga Hrdaya*, *Uttara Sthāna*, ch 40, ver 82 (1st ed, vol ii, p 826)

⁴ See Chakrapānidatta's Commentary, in Tübingen MS, no 463, fol 534 b

⁵ e g Chakrapānidatta's Commentary (ed Visiād), p 123, ll 18, 19, cf *Caraka Samhitā* (ed Jiv, 1896), *Siddhi Sthāna*, vi, ver 3, p 887, *ibid*, p 238, ll 15, 16, cf *Siddhi Sthāna*, vi, ver 19, p 888

⁶ e g in Visiād's edition, p 15, ll 17, 18, cf *Astānga Hrdaya*, *Sūtra Sthāna*, ch i, ver 3 (1st ed, vol i, p 6), *ibid*, p 124, ll 12, 13, cf *Ast Hrd*, *ibid*, ch xiii, ver 33 (vol i, p 282), *ibid*, p 250, ll 22, 23, cf *Ast Hrd*, *Nīdāna Sthāna*, ch x, ver 21 (vol i, p 772) — As Vāgbhata II so extensively reproduces the text of Vāgbhata I, it is important to note that in this, as well as in the preceding footnotes concerning Mādhava and Drīdhabala, only such passages have been selected as evidence as are found only in the *Samgraha* of Vāgbhata I, or in the *Samhitā* of Vāgbhata II, according as the case in hand required

and Vāgbhata II These three medical authors, accordingly, must have their place somewhere between the seventh and eleventh centuries A D

8. *Mādhava* Coming now to the chronological place of Mādhava, Dridhabala, and Vāgbhata II, relatively to one another—a point still involved in much obscurity—the trend of the available evidence appears to make for the following positions In the first place Mādhava is anterior to Dridhabala There are two facts which seem to be conclusive on this point One concerns the enumeration of the diseases of the eye. Suśruta II, giving a detailed list, counts seventy-six such diseases, while Vāgbhata I, recasting the list of Suśruta II, makes out a total of ninety-four Mādhava, who elects to abide by Suśruta II's method of counting, nevertheless increases the total to seventy-eight,¹ by adding two diseases of the eyelashes Vāgbhata II simply adopts the list of Vāgbhata I Dridhabala, attempting a compromise, states the total to be ninety-six² He does not explain how he arrived at that total, nor, indeed, does he give any details at all, but simply refers the curious on the subject to other medical authorities. In these circumstances it may be

¹ The memorial verses, as commonly printed in Mādhava's *Nidāna*, giving a total of seventy-six, are spurious and false Jivānanda's edition gives them at the end (p 347), but Uday Chand Dutt's edition at the beginning (p 220) of the chapters on the diseases of the eye Moreover, they do not agree with Mādhava's own text, for they omit the two diseases of the eyelashes (*paksma-kopa* and *paksma-śāta*), mentioned by Mādhava at the end of the last of those chapters (Jiv, p 347, verses 22, 23, U C Dutt, p 236) Adding these two diseases, the total becomes seventy-eight The various systems of enumerating the diseases of the eye adopted by Suśruta II, Vāgbhata I, Mādhava, and Dridhabala respectively, are very complicated It is impossible, in the present case, to state more than the simple facts In a subsequent dissertation on the diseases of the eye I hope to have an opportunity of explaining the details

² In *Caraka Samhitā, Cikitsita Sthāna*, ch xvi, ver 222 (Jiv, p 761) The edition published by the two Sens reads seventy-six (p 884, l 4), but this is a mere reprint from Gangādhara's Berhampore edition (p 575), for which there is no known manuscript authority It appears to be an 'emendation' of Gangādhara himself All existing MSS read ninety-six, e.g. Tübingen MSS, No 458, fol 632 a, l 2, and No 459, fol 216 b, l 5, India Office MSS, No 335, fol 419 b, l 1, and No 359, fol 153 a, l 7, Deccan College MS, No 925, fol 334 a, l 6

concluded that Drīdhabala obtained his total of ninety-six by adopting Vāgbhata I's total of ninety-four (which corresponds to Suśruta II's total of seventy-six) and adding to it the two new diseases set up by Mādhava. It thus follows that Mādhava is anterior to Drīdhabala. The second fact concerns the so-called Kashmir Recension (*Kāśmīra-pāṭha*) of Charaka's Compendium. Vijaya Rakshita, in his commentary (called *Madhukosa*) on Mādhava's Pathology (*Nidāna*), notices several passages, cited by Mādhava from Charaka's Compendium, where the Kashmir Recension differs from the Recension quoted by Mādhava. The inference is that Mādhava cites the passages as written by Charaka himself, that the Kashmir Recension was not known to him, and that, in fact, that Recension was not yet in existence. Seeing that the Kashmir Recension was the work of the Kashmir physician Drīdhabala (§ 1), it follows that Drīdhabala is posterior to Mādhava. No doubt every link in this chain of inference possesses no more than probable force, still, the cumulative effect of the two arguments is to raise the presumption that, as a fact, Mādhava is anterior to Drīdhabala.¹

9 *Drīdhabala*. In the second place, Drīdhabala is anterior to Vāgbhata II. The latter, in one of the concluding verses of his Compendium,² refers to the very insufficient character of the information on the diseases of the eye to be found in Charaka's Compendium as compared with that given in Suśruta's Compendium. Seeing that that information is contained in one of Drīdhabala's complementary chapters,³ Vāgbhata's remark proves that he was

¹ It is true that the commentator Vijaya Rakshita (c 1240 A D), in an explanatory statement on *Nidāna* (ed Jiv, p 147), xxii, 5, ll 1, 2 = *Charaka Samhitā, Cikitsita Sthāna*, xxviii, ver 24 (Jiv, p 773), apparently implies the posteriority of Mādhava to Drīdhabala. But it should be observed that the object of Vijaya Rakshita is not to make a chronological, but an exegetical statement. The chronological implication may not have been intended by him, even assuming that in the thirteenth century the exact chronological relation of Mādhava to Drīdhabala was still within the knowledge of medical writers.

² See *Astānga Hrdaya, Uttara Sthāna*, ch xl, ver 83, in the 1st ed, vol ii, p 826.

³ Viz the twenty-sixth chapter on *Trimarmāya* in the *Charaka Samhitā, Cikitsita Sthāna*, verses 221-56 (Jiv ed, 1896, pp 761-4). The fact that Vāgbhata II simply speaks of Charaka's Compendium

acquainted with Dridhabala's completion of Charaka's Compendium. Moreover, Vāgbhata II not infrequently revises the versified form in which prose passages had been quoted by Dridhabala from the Summary (*Samgraha*) of Vāgbhata I¹. Lastly, it may be noted that Arunadatta, in his commentary on Vāgbhata II's Compendium, expressly refers to Dridhabala's edition of the Compendium of Charaka as the source of one of the verses of Vāgbhata II². This last point is particularly effective. The verse in question occurs in the introductory portion of the nineteenth chapter of Charaka's Compendium on the Treatment of Chronic Diarrhoea³ (§ 99, cl. 2). In that portion Dridhabala summarizes in versified form the prose account of the subject in the Anatomical Section of the Summary of Vāgbhata I⁴. That it is really a summary of Vāgbhata I's account is obvious from the fact that his terms and phrases are as far as possible retained by Dridhabala. Vāgbhata II still further summarizes the summary of Dridhabala, and that his doubly summarized account is really based on the latter, but not on Vāgbhata I, is shown by the fact that it contains none of the terms and phrases of the latter, but retains intact three of the verses (among them the

without any reference to Dridhabala's authorship of the chapter in question creates no difficulty. As observed in § 1, the whole work, inclusive of Dridhabala's complement, came to be known simply as Charaka's Compendium, and it is not at all uncommon to find Dridhabala quoted as 'Charaka', e.g. by Vijaya Rakshita in his *Madhukosa* (Jiv, 1901), pp 159, 161, 163.

¹ e.g. the prose direction in *Samgraha*, *Cikitsita Sthāna*, ch. xvi (vol. II, p. 99, l. 23), is expressed by Dridhabala in a single verse (*Charaka Samhitā*, *Cik*, xviii, ver. 85 a, Jiv, p. 646), while Vāgbhata II gives it in two verses (*Astānga Hrdaya*, *Cik*, xv, verses 96 b, 97 a, in 1st ed., vol. II, p. 285). Other examples are Vāgbhata II in *Cikitsita*, xv, verses 61 b-63 (vol. II, p. 279) and verses 91 b, 92 (vol. II, p. 284), compared with Dridhabala, in *Cik*, xvi, verses 67 b-69 (Jiv, pp. 644-5) and verses 80, 81 (Jiv, p. 645), and with Vāgbhata I's prose in *Cik*, xvii (vol. II, p. 98, ll. 9-12, and p. 99, ll. 21-23).

² See *Astānga Hrdaya* (1st ed.), vol. I, p. 571, l. 19. The verse in question is 62 b, 63 a, in the third chapter of the *Sārīra Sthāna*.

³ See *Cikitsita Sthāna*, *Grahanī-roga*, xix, ver. 14, in Jiv ed., 1896, p. 656.

⁴ See *Astānga Samgraha*, *Sārīra Sthāna*, ch. vi, in the Bombay ed., vol. I, pp. 230 ff.

verse in question) of Drīdhabala¹ This state of things was evidently realized by Arunadatta, for, as already stated, he expressly mentions Drīdhabala as the source of Vāgbhata II

10 *Then Dates* The evidence of Arabic sources points to the seventh or eighth century for Mādhava, and that of Tibetan and other sources to the eighth or ninth century for Vāgbhata II² According to the evidence, already explained, Drīdhabala takes his place intermediately between Mādhava and Vāgbhata II. Accordingly it is probable that all these three medical writers come in the period from the seventh to the ninth century, at no very great interval from one another In any case none of them can be later than c 1060 A D, the date of Chakrapāṇidatta

11 *Commentators and their Dates* Of early commentators on the Compendia of Charaka and Suśruta, and on the Summary of Vāgbhata I, whose works have come down to us, the following may be mentioned

On Charaka's Compendium we have Chakrapāṇidatta's Commentary, called *Charaka Tātparyā Tīkā* (i e Explanation of Charaka's Meaning) or *Ayurveda Dipikā* (i e Light on General Medicine) Its author is known to have lived about 1060 A D

On Suśruta's Compendium we have Dallana's commentary, called *Nibandha Samgraha*, or Summary of Commentaries The earliest known quotations of this work are by Hemādri and Vāchaspati,³ who lived about 1260 A D, and as Dallana himself quotes Chakrapāṇidatta, he should be placed in the twelfth century He frequently quotes also a commentary (*pañjikā* or *candrikā*) by Gayadāsa (or simply Gayān), called *Nyāya Candrikā*, or Reasoned Elucidation Gayadāsa, therefore, cannot be placed later than the eleventh century, and he may have been a contemporary of Chakrapāṇidatta, seeing that neither appears to quote from the other⁴

¹ Namely, verses 59, 60, 62 in *Astānga Hṛdaya, Sārīra Sthāna* ch iii (1st ed, vol 1, pp 566, 567, 569)

² For details and authorities see Professor Jolly's *Indian Medicine*, §§ 5, 6, pp 7-9

³ According to information by letter (October 30, 1904) from Dr P Cordier

⁴ See Professor Jolly in the *Journal of the German Oriental Society*, vol lvi, p 114 ff, and Dr P Cordier's *Récents Découvertes*, p 15

On the Compendium of Vāgbhata II we have a commentary by Arunadatta, called *Sarvāṅga Sundarī* (i e Excellent in all Branches of Medicine)¹ On the Pathology (*Nīdāna*) of Mādhava there exists a commentary, called *Madhukosa* (i e Receptacle of Honey), the joint work of Vijaya Rakshita and his pupil Srikanthadatta, and another by Vāchaspati, called *Ātanka Darpana* (i e Mirror of Diseases) The latter, as he himself states (in verse 4 of his Introduction), consulted the *Madhukosa* for the purpose of writing his own commentary, and Vijaya Rakshita controverts a certain doctrine of Arunadatta regarding the structure of the eye² Vāchaspati further states (in verse 5 of his Introduction) that his father Pīamoda was chief physician at the court of 'Mahamada Hammīna', that is, of the Amīr Muizzuddīn Muhammad (the celebrated Muhamed Ghori) who reigned in Delhi from 1193 to 1205 A D Moreover, Vijaya Rakshita quotes Gunākara who wrote the *Yogatnamālā* in 1239 A D³ Accordingly we obtain the following approximate dates

Arunadatta, about 1220 A D

Vijaya Rakshita, about 1240 A D

Vāchaspati, about 1260 A D

12 *Bhāskara Bhatta and Bhava Mīsā* To a slightly earlier date than that of Chakrapānidatta belongs a medical author, Bhāskara Bhatta He appears to have lived about 1000 A D⁴ He wrote a tract on Anatomy, called *Śārīra Padmīnī* (i e Lotus among Works on Anatomy) The state-

For further information on the commentaries on Suśruta's Compendium, see my Article in the *Journal of the Royal Asiatic Society of London* for 1906, p 283

¹ The title makes a pun it also means 'a woman beautiful in all her limbs'

² It concerns the true position of the so-called *bāhya patala* or outer cover of the eyeball, i e the cornea plus aqueous humour See *Astāṅga Hṛdaya, Uttara Sthāna*, ch xii, ver 1 (in 1st ed, vol II, p 516)

³ Information by letter (October 30, 1904) from Dr P Cordier The quotation occurs in the *Madhukosa* on *Nīdāna*, v, 7 (Jiv, p 68) On the date of Gunākara, see Peterson's *Report*, 1886-92, p xxvi

⁴ See *Epigraphia Indica*, vol I, p 340 The *Śārīra Padmīnī* was brought to notice by Dr P Cordier in his *Récentes Découvertes*, p 30

ments on the skeleton, contained in this treatise, reproduce the doctrine of Suśruta, as modified by Vāgbhata I (see § 36)

A very much later author, who also reproduces Suśruta's doctrine on the skeleton, and who will be mentioned occasionally in the following pages, is Bhāva Miśra. He lived in the sixteenth century, and wrote a voluminous compilation, of no originality, from previous medical writings, under the name of *Bhāva Prakāśa* (i. e. Manifestation of the Truth)

SECTION II

TEXT-CRITICAL THE RECORDS

A THE SYSTEM OF ĀTREYA-CHARAKA

§ 3. *Charaka's Statement, and its Recensions*

THE Medical Version of Ātreya's system of the bones of the human body, as handed down by Charaka, is contained in the beginning of the seventh chapter (*adhyāya*) of the fourth or Anatomical Section (*Śārīra Sthāna*) of his Compendium

There exist two recensions of Charaka's statement. One is contained in the edition of the Compendium which was printed by Jivānanda Vidyāsagara in Calcutta in 1877, where it is found on page 370, lines 5-19. The other occurs in Gangādhara's edition, page 186, lines 11-22, printed in Behampore, 1879 (*Bahampore, samvat 1936*). These two recensions differ so widely from each other that it is necessary to inquire into their respective authorities.

The recension of Jivānanda has the following witnesses in its favour. In the first place, it has the support of all accessible manuscripts. I have been able to examine the following nine.

1. The two Tübingen University MSS, M a I 458 and 459 (Cat, Nos 141, 142). They come from Benares, whence they were procured by myself for the late Professor von Roth in 1873. The original MS from which No 142 was copied is dated in *samvat* 1778, i.e. 1721 A.D.

2. The two India Office MSS, Nos 335 and 881 (Cat, Nos 2637 and 2640), originally belonging to the Colebrooke Collection, and therefore probably from Calcutta. No 2640 is dated 1806 A.D.

3 The two Deccan College MSS, No 368 (Bhandarkar's Report of 1882-3) and No 925 (Kathavate's Report of 1891-5), from Western India, dates unknown¹

4 Two Kashmir MSS, in Śāradā characters One, No 3266 (p 182 of Dr Stein's Catalogue), belongs to the Jammu Library, and was excerpted for me through Dr Stein's kind intermediation The excerpt from the other I owe to the kindness of Dr P Cordier (see his *Récents Découvertes*, p 9) The dates of these two MSS are unknown, but as both are written on paper they must be comparatively modern

5 The Alwar Palace Library MS, No 1624, an excerpt from which was transmitted to me by the kindness of Major P. T. A. Spence, the British Political Agent

It should be observed that these nine MSS come from widely separated Indian localities They are, therefore, independent witnesses—a fact which enhances their testimony

In the second place, the recension of Jīvānanda has the support of the oldest existing commentary of Chakrapāṇidatta (c 1060 A D) A considerable number of names of more or less ancient glossators or commentators is known, for a list of which Dr P Cordier's *Récents Découvertes*, pp 10, 11, may be consulted But the commentary of Chakrapāṇidatta is the only one that now survives, and even of it, manuscripts are extremely rare, and all are incomplete I was able to consult the Tübingen University MS, M a I 463 (Cat, No 146) It fortunately contains Chakrapāṇidatta's glosses on Charaka's statement in question These glosses are based entirely on the recension which is printed in Jīvānanda's edition, and while they refer to various interpretations of it, they give no indication whatsoever of the existence of a recension even faintly resembling that of Gangādhara's edition

In the third place, the recension of Jīvānanda has the support of the Medical Version of Ātreyā's system as handed down by Bheda (or Bhela), as well as of the Non-medical Version of that system as preserved in Yājñavalkya's Law-book and other non-medical works (see § 14) Seeing that all three versions—the

¹ The loan of these two MSS I owe to the kindness of Professor K. P. Pathak, of the Deccan College

Medical Versions of Charaka and Bheda, and the Non-medical Version—equally profess to present the teaching of Ātreya, their almost verbal agreement affords the strongest testimony in favour of Jivānanda's recension of the Version of Charaka

On the other hand, the recension of Gangādhara—so far as I have been able to ascertain—is absolutely destitute of all support. It first appears in the Berhampore edition of 1879, published by Dharanidhar Ray. Neither Gangādhara nor Dharanidhar refers to any MSS, nor does either mention any *variae lectiones*. The same recension next appears in the Calcutta edition of Avināś Chandra Kaviratna (1884). He does not state his sources, but, to all appearance, he simply reprints from the Berhampore edition. The same recension once more appears in the Calcutta edition of Debendranath Sen and Upendranath Sen (1897). In their preface the joint editors profess not only to have collected, with much trouble and expense, 'many manuscripts from Kāśī [Benares], Kashmir, Bombay, Dravida [Madras?], Poona, and other places,' but also to have consulted some very old (*prācīna-tama*) and correct (*viśuddha*) MSS in their own possession. It will be well to receive this statement with considerable reserve, for it is well known that MSS. of Charaka's Compendium are neither so common, nor so old, nor so correct as the joint editors suggest. They very rarely quote any *variae lectiones*, and in the few cases in which they do so they never refer to any particular MS authority. Thus in the whole Anatomical Section, comprising eight chapters (seventy-six pages in print), they mention only two unimportant, and unidentified variants (in the eighth chapter, p. 429). In the seventh chapter of that section which contains the statement on the skeleton, they mention no variants at all, nor give any indication whatsoever of their being aware of the existence of an entirely discrepant recension. Under these circumstances, despite the claim made in the preface, the conclusion is unavoidable that the joint edition is essentially nothing more than a reprint from Avināś Chandra's, and ultimately from Gangādhara's editions. The three aforesaid editions are prints produced in Calcutta, or at least in Bengal. Recently the same recension has been published in Bombay, by Sankara Shastri, in a cheap edition

This fact, at first sight, might be thought to suggest the existence of some MS source in Bombay, but cheap editions do not go to the trouble and expense of collating MSS, but usually reprint already existing editions, and there can be no reasonable doubt that the Bombay edition is but a reprint from its Calcutta predecessors

So far it has been impossible to trace Gangādhari's recension back any farther than his own Behampore edition. When we add—what will be shown in detail in subsequent paragraphs (§§ 9, 10)—that that recension is not only full of incongruities and inconsistencies, but that it also presupposes a knowledge of the system of Suśruta, some of whose peculiar terms (e.g. *kūṇca* or cluster of bones) it adopts, the conclusion is irresistible that, in all probability, it reproduces no genuine text of any Charaka MS, but is an ill-considered attempt of Gangādhari himself to reconstruct or (as he thought) improve the text of the, perhaps grossly incorrect, MS, or MSS of Charaka's Compendium, which he may have had at his disposal in the preparation of his edition. The spurious recension, thus originated, was afterwards unquestioningly and thoughtlessly adopted by Gangādhari's Bengal successors. All the more credit is due to Jivānanda for preserving, in his earlier edition of 1877, the genuine recension of the text of Charaka's Compendium, and it is much to be regretted that in his recent re-edition of 1896 (p. 351, clause 5) he should have been misled into substituting the spurious recension of Gangādhari.

§ 4 *The genuine Recension of Charaka*

The genuine traditional recension of the statement of Charaka on the bones of the human body runs as follows (Original Text in § 71)

‘The body consists of the following parts (*anga*) the two arms (*bāhu*), the two legs (*śakti*), the head and neck (*śiro-griha*), and the trunk (*antarādhī*). These make up the sexipartite (*śadanga*) body. Inclusive of the teeth and nails, it has three hundred and sixty bones. These are

- 1 32 teeth (*danta*)
- 2 32 sockets (*ulūkhala*) of the teeth
- 3 20 nails (*nakha*)

- 4 60 phalanges (*angulī*) in the hands and feet
- 5 20 long bones (*śalākā*) of the hands and feet
- 6 4 bases of the long bones (*śalāk-ādhiśthāna*)
- 7 2 heels (*pāśmī*)
- 8 4 ankle-bones (*gūlpha*) of the two feet¹
- 9 2 wrist-bones (*manikā*) of the two hands¹
- 10 4 bones of the two forearms (*aīratni*)
- 11 4 bones of the two legs (*jaṅghā*)
- 12 2 knee-caps (*jānu*)
- 13 2 elbow-pans (*jānu-kapālīkā*).¹
- 14 2 hollow bones (*nālaka*) of the two thighs (*ūru*)
- 15 2 hollow bones (*nālaka*) of the two arms (*bāhu*).
- 16 a. 2 shoulders (*amsa*)
- 16 b. 2 shoulder-blades (*amsa-phalaka*)
- 17 2 collar-bones (*aḥsaka*)
- 18 1 windpipe (*gatrū*)
- 19 2 palatal cavities (*tāl-ūśaka*)
- 20 2 hip-blades (*śroni-phalaka*)
- 21 1 pubic bone (*bhag-āsthī*)
- 22 45 back-bones (*msthā-gat-āsthī*)
- 23 15 bones of the neck (*grīvā*)
- 24 14 bones of the breast (*uśas*)
- 25 a. 24 ribs (*pāśvika*) in the two sides
- 25 b. 24 sockets (*sthālaka*) of the ribs
- 25 c. 24 tubercles (*aībūda*) fitting into the sockets
- 26 1 (lower) jaw-bone (*hanu-asthī*), or chin
- 27 2 basal tie-bones of the (lower) jaw (*hanu-mūla-bandhana*)
- 28 1 bone constituting the nose, prominences of the cheeks,
and brows (*nāsikā-gandakūṭa-lalāṭa*)
- 29 2 temples (*śankha*)
- 30 4 cranial pan-shaped bones (*śiśah-kapāla*)

These are the three hundred and sixty bones, inclusive of the teeth and nails'

§ 5 Ancient Inconsistency

There is a slight inconsistency in the statement of Charaka which it may be well to point out at once. In the introductory clause which enumerates the six *anga*, or constitutive parts of the body, Charaka places these parts into three divisions,

¹ The terms 'ankle-bone' and 'wrist-bone', here and throughout this dissertation, signify the malleoli and styloid processes respectively, also, 'elbow-pan' signifies the olecranon process

viz (1) the extremities (two arms and two legs), (2) the head and neck, and (3) the trunk That Charaka looked upon the head and neck as constituting but one division, apart from the extremities and the trunk, is shown by his using a peculiar compound word *śiro-grīvā*, made up from *śiras*, head, and *grīvā*, neck, to indicate that division—a circumstance which the commentator Chakrapāṇidatta is careful to point out (§ 11) Now, though Charaka does not (as Suśruta and Vāgbhata I do, §§ 28, 37) expressly state that his enumeration of the bones follows the three divisions, yet certain divisions are clearly discernible in it only they are not quite consistent with his introductory clause First, we have a small preliminary division, comprising Nos 1-3, the teeth, then sockets, and the nails, altogether eighty-four bones That these form a kind of supplemental division is, indeed, indicated by Charaka himself in the introductory clause Next, there comes the first proper division, comprising Nos 4-15 It refers to the four extremities, and includes 108 bones Thirdly, we have the second division, referring to the trunk It comprises Nos 16-25, and includes 158 bones Lastly, there is the third division, comprising Nos 26-30 It refers to the head alone, and includes ten bones The bones belonging to the neck are found classed in the second division, which deals with the trunk They form Nos 18 and 23, and include sixteen bones There is also No 19, two palatal cavities, which properly belongs to the head Agreeably with Charaka's own introductory clause one would expect these eighteen bones to be classed with those of the head in the third division, and to stand immediately before No 26, jaw-bone The probability is that they did stand so in the text as it left Charaka's hands, and that the misplacement is due to unintelligent copying in later times This surmise receives considerable support from the fact that in the parallel Non-medical Version of Ātreyā's system (§ 16) we find that the bones of the neck, Nos 18 and 23 (Nos 19, 20 in § 16), actually take their proper place immediately before the bones of the head (see § 17, cl 1 a) It is true that in this Version, too, No 19, the palatal cavities, is similarly misplaced, and that the Medical Version of Bheda (§ 12) shows exactly the same misplacements as the

Medical Version of Charaka But this circumstance only proves that the misplacements must be of very ancient date

§ 6 *Ancient Corruptions*

There is a further point in which the traditionally transmitted form of the Medical Version of Charaka is almost certainly corrupted No 16 *a*, two shoulders (*amsa*), is evidently superfluous By the side of No 16 *b*, two shoulder-blades (*amsa-phalaka*), and No 17, two collar-bones (*aksaka*), there is no room left for any 'shoulders' (see § 56) The repetition of a word is not at all an uncommon clerical error Thus the Tübingen MS, No 458, reads *bāhu*, arms, and *ūru*, thighs, in addition to No 15, *bāhu-nalaka*, hollow bones of the arms, and No 14, *ūru-nalaka*, hollow bones of the thighs Similarly the Deccan College MS, No 368, and the Bheda MS repeat *ūru* by the side of *ūru-nalaka*, likewise the Alvar Palace MS and one of the Śārādā MSS repeat *bāhu* by the side of *bāhu-nalaka*, see the critical notes in § 72 In these cases, there cannot be the smallest doubt that we are simply confronted by clerical errors But by parity of reasoning, it is as good as certain that in No 16 *a*, *amsa*, shoulder, we have a very ancient false repetition, due to the immediately following No 16 *b*, *amsa-phalaka*, shoulder-blade, which, probably owing to its adoption in the system of Vāgbhata I (§ 38, cl 2), succeeded in establishing itself permanently in all MSS In confirmation it may be noted that in the parallel Non-medical Version of the Law-book of Yājñavalkya, the item *amsa* is actually omitted (§§ 16 and 17)¹ The omission of No 16 *a*, *amsa*, shoulder, of course, renders the total of 360 short by 2 (viz 358), but, on the other hand, the probability is that in No 9 the correct reading should be four wrist-bones (*mamla*) instead of two For, as a matter of fact, as will be shown in the sequel (§ 52, cf pp 30, 49, 50, 63), there are four wrist bones, homologous to the four ankle-bones

Another instance of a similar ancient false repetition we have in No 13, *kapālikā*, elbow-pan, where now all MSS read *jānu-kapālikā*, falsely duplicating the preceding No 12, *jānu*, knee-

¹ The omission, here suggested, is also confirmed by the osteological summary which is given in the hymn of the Atharva Veda, see § 43, cl 6

cap Here, again, it may be noted that the parallel Non-medical Version does not exhibit the duplication of *jānu* It has simply No 12, *jānu*, knee-cap, and No 13, *lapola*, elbow-pan the latter being really a false reading for *lapāla* (§ 53)

§ 7 Restoration of the Statement of Charaka

Admitting the emendations indicated in the two preceding paragraphs, the correct form of Charaka's statement of the Medical Version may be restored as follows (Original Text in § 73)

- 1 32 teeth (*danta*)
 - 2 32 sockets (*ulūkhala*) of the teeth
 - 3 20 nails (*nakha*)
 - 4 60 phalanges (*angulī*)
 - 5 20 long bones (*śalākā*)
 - 6 4 bases of the long bones (*śalāk-ādhisthāna*)
 - 7 2 heels (*pāśni*)
 - 8 4 ankle-bones (*gūḍha*)
 - 9 4 wrist-bones (*manika*)
 - 10 4 bones of the forearms (*aratni*)
 - 11 4 bones of the legs (*jangha*)
 - 12 2 knee-caps (*jānu*)
 - 13 2 elbow-pans (*lapālīkā*)
 - 14 2 hollow bones (*nalaka*) of the thighs (*ūru*)
 - 15 2 hollow bones (*nalaka*) of the arms (*bāhu*)
 - 16 2 shoulder-blades (*amsa-phalaka*)
 - 17 2 collar-bones (*akṣaka*)
 - 18 2 hip-blades (*śroni-phalaka*)
 - 19 1 pubic bone (*bhag-āsthī*)
 - 20 45 back-bones (*prsthā-gat-āsthī*)
 - 21 14 bones of the breast (*uras*)
 - 22 a 24 ribs (*pāśvika*)
 - 22 b 24 sockets (*sthālika*) of the ribs
 - 22 c 24 tubercles (*arbudā*) fitting into the sockets
 - 23 15 bones of the neck (*grīvā*)
 - 24 1 windpipe (*gatrū*)
 - 25 2 palatal cavities (*tāl-ūśaka*)
 - 26 1 (lower) jaw-bone (*hanu-āsthī*) or chin
 - 27 2 basal tie-bones of the jaw (*hanu-mūla-bandhana*)
 - 28 1 bone constituting nose, prominences of the cheeks and brows (*nāsikā-gandakūta-lalāta*)
 - 29 2 temples (*śankha*)
 - 30 4 cranial pan-shaped bones (*śiraś-kapāla*)
- Total 360

§ 8 *Gangādhara's Recension*

Gangādhara's recension of the statement of Charaka on the bones of the human body runs as follows (Original Text in § 74)

'The body consists of the following parts two arms (*bāhu*), two legs (*sakti*), the head and neck (*śiro-griṇa*), and the trunk (*antarādhi*). These make up the sexipartite body (*sadanga*). Inclusive of the teeth, then sockets, and the nails, it has three hundred and sixty bones. These are

- 1 32 sockets (*ulūkhala*) of the teeth
- 2 32 teeth (*danta*)
- 3 20 nails (*nakha*)
- 4 20 long bones (*śalākā*)
- 5 a 4 bases (*adhīsthāna*) of the long bones
- 5 b 4 backs (*pīṣṭha*) of the hands and feet
- 6 60 phalanges (*anguli*)
- 7 a 2 heels (*pāṇi*)
- 7 b 2 clusters (*khāṇḍa*) of bones below (the long bones)
- 8 4 wrist-bones (*manika*)
- 9 4 ankle-bones (*gūlpha*)
- 10 4 bones of the forearms (*aratni*)
- 11 4 bones of the legs (*jangha*)
- 12 2 knee-caps (*jānu*)
- 13 2 elbow-pans (*khūpara*)
- 14 2 thighs (*ūru*)
- 15 2 arms (*bāhu*) together with (16) the shoulders (*amsa*)
- 17 2 collar-bones (*aṅṣaka*)
- 18 2 palates (*tālū*)
- 19 2 hip-blades (*śiroṇi-phalaka*)
- 20 a 1 vulval bone (*bhag-āsthī*) in women, or penis-bone (*medhī-āsthī*) in men
- 20 b 1 sacral bone (*triṅka*)
- 20 c 1 anal bone (*gud-āsthī*)
- 21 35 back-bones (*pīṣṭha-gata*)
- 22 15 bones of the neck (*griṇā*)
- 23 2 collar-bones (*gatni*)
- 24 1 (lower) jaw-bone (*hanu-asthī*), or chin
- 25 2 basal tie-bones of the jaw (*hanu-mūla-bandhana*)
- 26 a 2 brows (*lalāṭa*)
- 26 b 2 eyes (*aṅṣi*)
- 26 c 2 cheeks (*gandā*)
- 26 d 3 nasal bones (*nāsikā*) called *ghona*
- 27 a 24 bones of the two sides (*pāṇīva*)
- 27 b 24 ribs (*pāṇīvaṅka*) forming a cage (*pañjarā*)

- 27 c 24 sockets of them (*sthāḷaka*) resembling tubercles (*an-buda*), the whole (27 a-c) amounting to 72
 28 2 tempoal bones (*śankhaka*)
 29 4 cranial pan-shaped bones (*śṛaṅh-kapāla*)
 30 17 bones of the breast (*vaḥsas*)
 These are the three hundred and sixty bones'

§ 9 *Inconsistencies and Incongruities of Gangādhara's Recension*

1 Gangādhara's recension of the statement of Charaka is full of inconsistencies and incongruities. To begin with, the sum of the several items of the list does not agree with the total stated at its conclusion. The latter is 360, while the former is either 370 or 368, according as No. 16 is counted separately, or together with No. 15, though the wording of the clause in the original seems to imply that Nos. 15 and 16 are to be taken as a single item. The attempt of Gangādhara to remove this inconsistency will be explained in the next paragraph. In the meantime, other inconsistencies are now enumerated in the order of their occurrence in the list of Gangādhara.

(a) Nos. 4 and 5 b are obviously the very same bones, that is to say, the long bones of the metacarpus and metatarsus. It makes no difference whether they are considered from the inner side (palm, or sole, No. 4) or from the outer side (back, *prsthā*, No. 5 b) of the hand or foot.

(b) Similarly Nos. 5 a and 7 b are the identical bones of the carpus and tarsus. This will be fully explained in the sequel (§ 49). Here it may be noted that *kūṇḍika*, or cluster, is the term for these bones which was introduced by Suśruta in substitution of Charaka's term *adhīsthāna* (or *sthāna*), base (§ 28). Its appearance in the recension of Gangādhara proves that that recension cannot possibly represent the genuine text of Charaka, but that it was prepared subsequently with a knowledge of the terminology of Suśruta. This remark also applies to Gangādhara's use of the term *kūṇḍipara* for elbow-pan (olecranon, No. 13), see §§ 21, 28.

(c) In No. 20 a, the distinction between the so-called 'vulval bone' (*bhagāsthī*) and the 'penis-bone' (*medhīāsthī*) involves an

obvious anatomical absurdity Neither the vulva nor the penis is a bony structure It has arisen from a misunderstanding of Charaka's term *bhagāsthī*, which refers to the pubic bone, i e the pubic arch (§ 60) The word *bhaga*, by itself (but not in conjunction with *asthī*, bone) denotes also the vulva, &c, or the external female sexual organs, and the term *bhagāsthī*, having been erroneously identified with the term *bhaga*, led further to the erroneous fabrication, and introduction, of a term *medhīāsthī*, or 'penis-bone', for the male sexual organ (§ 60) The anatomical misconception involved in this procedure alone must be fatal to any claim of Gangādhara's recension to represent the genuine text of Charaka

(d) The principle of enumeration involved in Nos 20 *b*, 20 *c*, and 21, differs entirely from that of Charaka's genuine No 22 (§ 4) which counts forty-five back-bones It will be shown in the sequel (§ 59, see also § 19) not only that the principle of counting which underlies the system of Gangādhara's recension presupposes a knowledge of Suśruta's principle of counting the back-bones, but that it applies that principle in an unintelligent way

(e) No 23 is affected by a double incongruity The recension of Gangādhara counts two *jaṭiṇi* From this circumstance it is clear that he understands the word *jaṭiṇi* to refer to the two collar-bones Now this is a comparatively late meaning of the word which is not traceable farther back than the *Amaśloka*, a Sanskrit vocabulary of uncertain date, but probably written in the early part of the sixth century A D At all events, as will be shown in the sequel (§ 62), in the early medical works, *jaṭiṇi* uniformly refers to the neck, or the windpipe in the neck Its use, therefore, in the sense of collar-bone proves that the recension of Gangādhara cannot represent the genuine text of Charaka Moreover, its use in that sense involves the further incongruity of counting the collar-bones twice, for No 17, *aḥśaka*, also refers to the collar-bones

(f) No 26 *a*, *b*, *c*, *d*, as will be shown in the sequel (§ 66, see also pp 37 and 40), imply a view of the bones of the skull utterly at variance with that indicated in the genuine text of Charaka—a view, moreover, which presupposes a knowledge of Suśruta's views, imperfectly understood

(g) No 27 *a, b, c*, likewise, is affected by a double incongruity. One is of the formal kind: the ribs are pitchforked into the midst of the bones of the head, standing as they do between No 26, brows, eyes, cheeks and nose, and No 28, temporal bones. Moreover, as will be shown in the sequel (§ 58), the terms of the three parts of No 27, which, as given in the genuine text of Charaka, are perfectly intelligible and correct, convey no consistent or intelligible meaning in the recension of Gangādhara.

(h) No 30 is open to several objections. It counts 17 breast-bones against 14 of Charaka's genuine text (§ 4, No 24), and its larger count presupposes a knowledge of the system of Suśruta. The position of the breast-bones, too, at the very end of the list, after the bones of the head, is very curious. It is to be noted, however, that on this point the recension of Gangādhara follows the arrangement of the list as given in the Non-medical Version of Yājñavalkya's Law-book and the Agni Purāṇa (§ 16, No 27). This circumstance, combined with the fact that in his commentary Gangādhara refers to those two non-medical works by name, supports the surmise that the recension of Gangādhara is not based on any manuscript authority, but is an ill-judged construction of his own.

2 On three points, however, Gangādhara is undoubtedly right in his reconstruction. One of these refers to No 16, *amsa*, shoulder. The traditional text of the statement of Charaka had erroneously duplicated that item (§ 6). The recension of Gangādhara corrects that error, though, curiously enough, it does so by omitting the more accurate term *amsa-phalaka*, shoulder-blade. This curious circumstance clearly points to the use, by Gangādhara, of the existing traditional text of Suśruta's Compendium in the preparation of his recension of the statement of Charaka. For in that traditional text the term *amsa* is employed (though erroneously, as shown in §§ 30, 55, 56) in the sense of *amsa-phalaka* to denote the shoulder-blade. The second point refers to No 8, where the recension of Gangādhara reads 'four wrist-bones' instead of the 'two wrist-bones' of the traditional recension. Here, too, in all probability, his emendation is right (see § 52). The third point refers to the position of No 23, *jatru*. As

pointed out in § 5, this item is misplaced in the traditional list. The recension of Gangādhara, though it misinterprets the term, assigns to the item its correct place immediately after No. 22, *grīvāḥ*, neck-bones. In doing so—it may be noted again—Gangādhara simply follows the guidance of Yājñavalkya's Law-book and the Agni Purāṇa (§ 16, No 20).

§ 10 *Harmonization of Gangādhara's Recension*

In his commentary, Gangādhara makes a strenuous attempt to harmonize the actual total, 368 or 370, of the several items of his list with the required total 360. It involves a very forced manipulation of the list, which will now be explained. His procedure is as follows. It divides itself into five steps. The first step refers to the extremities. Excluding Nos 1 and 2 as well as Nos 5 *a* and 5 *b*, the remaining numbers down to No 16, give us 128 bones, that is to say, thirty-two bones for each of the upper and lower extremities. Next, adding Nos 1 and 2, that is, sixty-four bones, the total is raised to 192. The third step refers to the posterior part of the trunk. Transferring No 18 (*tālū*, palate) to a subsequent step, and counting No 20 *a* (the vulva and penis-bones) as a single item (for woman and man respectively), we obtain, from No 17 to No 21, a total of forty-two, which added to the previous total 192, raises it to 234. The fourth step refers to the head and neck. Transferring Nos 23 (*jaṭin*) and 27 *a, b, c* (ribs, &c) to the next step, but adding the previously omitted No 18 (palate), and counting from No 22 to No 29, we obtain a total of thirty-five, which added to the previous total 234, makes up 269. The fifth step refers to the anterior portion of the trunk. Here come in the previously omitted Nos 23 (*jaṭin*) and 27 *a, b, c* (ribs, &c), to which is added No 30 (breast-bones). These give a total of ninety-one, which, added to the previous total 269, finally results in the required total 360.

This scheme of harmonization is open to several serious objections.

1. It throws out of the count the two items No 5 *a*, bases of the long bones, and No 5 *b*, backs of the hands and feet.

Gangādhar would appear to have realized (what has been already pointed out in § 9) that these two numbers merely duplicate the items enumerated as Nos 7 *b* and 4 respectively. For the bones of the back of the hands and feet (No 5 *b*) are precisely the long bones (No 4), and the bases (No 5 *a*) are the clusters (*kūṇca*, No 7 *b*). So far Gangādhar, undoubtedly, is right, but his error is that he counts only two clusters. The subjoined tabular statement makes this perfectly plain.

	<i>Extremities</i>	<i>Upper</i>	<i>Lower</i>
No 3	Nails (<i>nakha</i>)	10	10
„ 4	Long bones (<i>śalākā</i>)	10	10
„ 5	Phalanges (<i>angulī</i>)	30	30
„ 7a	Heels (<i>pārsni</i>)	—	2
„ 7b	Clusters (<i>kūṇca</i>)	2	—
„ 8	Wrist-bones (<i>manika</i>)	4	—
„ 9	Ankle-bones (<i>gulpha</i>)	—	4
„ 10	Forearms (<i>aratni</i>)	4	—
„ 11	Legs (<i>jangha</i>)	—	4
„ 12	Knee-caps (<i>jānu</i>)	—	2
„ 13	Elbow-pans (<i>kūṇpara</i>)	2	—
„ 14	Thighs (<i>ūru</i>)	—	2
„ 15	Arms (<i>bāhu</i>)	2	—
Totals		64	64

This gives, as Gangādhar explains, a total of thirty-two bones for each of the four extremities, and a grand total of 128. But it will be noticed that he counts only the clusters (*kūṇca*) of the hands, that is, as we should call them, the carpal bones. He omits the other two *kūṇca*, that is, the clusters of tarsal bones of the feet. In their place, he counts two *pārsni*, that is, the heel-bones of the feet, for, as will be seen from the table, Gangādhar's arrangement of the bones of the extremities proceeds on the principle of homology. Now the heel-bones do belong to the tarsal cluster of bones, but, though they are its prominent constituents, they do not exhaust the cluster. The truth is that Gangādhar's recension of the statement of Charaka is a faulty adaptation to the scheme of Suśruta, which, as will be shown in the sequel (§ 49) consistently counts four *kūṇca*, or clusters of small bones. The genuine schemes of both, Suśruta and Charaka, are consistent, each in its own way, but the recension

of Gangādhara is inconsistent, and proves itself thereby not to be the genuine recension of the scheme of Charaka

2 With regard to the term *kūrca*, as used in the recension of Gangādhara, there is a special grammatical difficulty. The clause in question, *dve kūrcaḍhas*, is very difficult to construe. The only construction grammatically legitimate is to supply *asthīni*, that is, *dve asthīni kūrca-ḍhas*, or 'two bones below the *kūrca*'. This, however, yields no intelligible sense. In order to give the sense which Gangādhara wishes to extract from it, the clause should read *dve kūrce adhas*, i e 'two *kūrca* below (*scl* the long bones)', and this form of the clause could become *dve kūrcaḍhas* only through a very anomalous double *sandhi*, or contraction, viz. *kūrce adhas* = *kūrca[y]adhas* = *kūrcaḍhas*. Even so, the difficulty remains that *kūrca*—a word apparently first used by Suśruta in its anatomical application—is not neuter (*dve kūrce*), but masculine (*dvan kūrcau*), see Suśruta's Compendium, *Śārīra Sthāna*, chap vi, clause 29 (Jīva ed., p. 340). Avināsa Chandra, in his glosses to Gangādhara's recension which he adopts in his edition of Charaka's Compendium, apparently takes *kūrcaḍha* to be a single noun, synonymous with *kūrca*, but there exists no such noun in Sanskrit, and even if it did, the clause should read *dve kūrcaḍhe*.

3 A further difficulty in Gangādhara's scheme of harmonization is that it takes no account of the term *amsa*, shoulder, which his recension couples with the fifteenth item. The clause of that item reads *dve (scl asthīni) bāhvoḥ s-āmsayoḥ*, i e 'two bones in the arms together with the shoulders'. It seems obvious that arm and shoulder could not well be considered as constituting a single bone. Gangādhara avoids the difficulty by calmly ignoring the presence of *amsa*, shoulder, and explaining the clause to mean that 'there is one bone in each arm'. On the other hand, Avināsa Chandra, in his glosses, counts *amsa*, shoulder, separately. Consequently, with his counting two bones in the arms, and two in the shoulders, the list works out a total of even 370 bones. Seeing that the recension of Gangādhara nowhere mentions the shoulder-blades (*amsa phalaka*), it does seem not impossible that by the term *amsa* it intended to indicate those bones. If so, the dilemma presents itself did

Gangādhara intend shoulder-blade (*amsa*) to be counted separately from arm (*bāhu*), or to be taken as constituting with it but a single bone. In the former case, retaining in other respects Gangādhara's scheme of harmonization, the total works out at 362 bones (that is, Gangādhara's 360 *plus* the two *amsa*). In the latter case, we have the incongruity of treating arm *plus* shoulder-blade as a single bone. In either case, the recension of Gangādhara stands self-condemned as an incongruous and inconsistent compilation.

4 While, as we have just seen, the shoulder-blade, though such a prominent bone of the human body, is not given any distinct recognition in the recension of Gangādhara, the collar-bone, on the other hand, is counted twice over, under the denominations *aksaka* and *jatru* in Nos 17 and 23. The pair of *aksaka* Gangādhara explicitly defines in his commentary as being *kanthādho 'msakau*, that is, 'the two shoulder-bones below the throat'. This definition only fits the collar-bones. Anyhow, it fits them better than the shoulder-blades. It is also the usual interpretation of the term *aksaka*, given by other commentators who refer it to the collar-bones. As to the term *jatru*, Gangādhara gives no definition of it, but it is to be noted that, while the genuine recension of the statement of Charaka treats it as denoting a single bone, the recension of Gangādhara uses it as the name of a pair of bones. It will be shown in the sequel (§ 62) that when used in the latter way the term always refers to the collar-bones. The duplication of the collar-bones in the recension of Gangādhara is obviously fatal to its claim of being a genuine presentation of the text of Charaka.

§ 11 *The Glosses of Chakrapāṇidatta*

1 It has been stated in § 3 that the genuineness of Jivānanda's Recension of Charaka's statement on the bones of the human body is confirmed by the commentary of Chakrapāṇidatta written some time in the middle of the eleventh century A D. Manuscripts of this work are very rare, and in a more or less incomplete state. The subjoined translation has been made from the Tübingen University Library MS, M a I 463.

(Cat No 146),¹ where the original passage occurs in vol III, fols 284 b and 285 a. It runs as follows (Original Text in § 75)

2 'With reference to the list of bones, the words "head and neck" (*śiro-grīvam*) must be taken together, and signify but one part, viz the head. The word "trunk" (*antarādhā*) refers to the middle part of the body. The words "and sixty" (*sasta*) mean sixty additional to three hundred. The term "dental socket" (*dant-olūkhala*) signifies the place where the tooth is fixed. Though in the chapter on the various kinds of food and drink, the nails (*nakha*) are relegated to the waste products of the body on account of their being developed from the waste portion of what is taken as food, nevertheless, in the present case, on account of their resemblance to the bones, they are counted among the latter.² In each finger and toe there are

¹ The original of this MS was in Benares in 1873, where a copy of it was procured by me for the late Professor von Roth. It is rather inaccurate, but fairly complete, there being only a very large lacuna in the sixth section (*Cikitsita Sthāna*). Through the kind intermediation of Professor R Garbe I have the loan of it. Tübingen, No 145, is another incomplete copy of the same Benares MS. A second MS of the same commentary is recorded as No 2160 in the *Notices of Sanskrit MSS*. It is described as 'incomplete, containing only the first five books'. A third MS is being used by Kaviraj Haimath Viśṇuadāsa in his edition of Charaka's Compendium with Chakrapānidatta's Commentary (Calcutta, saka 1817 = A D 1895). A fourth MS, 'complet et bien conserve' is announced by Dr P Cordier in his *Récents Découvertes*, p 10, and (according to a private letter from him, October 30, 1904) is being copied for him. From a few passages, kindly collated by him for me it appears to agree closely with the Benares MS referred to above. A copy, from it, of the osteological statement was kindly supplied by him to me (§ 75). Further, two MSS, Nos 2503 and 2855, are stated in *Notices*, vol XI, p 39, to exist in the Government of India Collection in Calcutta, but on inquiry I am informed that No 2855 is lost, and No 2503, which I obtained on loan, I find on examination to be not a MS of Chakrapānidatta's Commentary, but a fragment of the text of Charaka's Compendium, viz the 30th chapter of the *Sūtra Sthāna* and the *Vimāna Sthāna*.

² The reference is to the 28th chapter of the Introductory Section (*Sūtra Sthāna*) of Charaka's Compendium. It is there explained that the food taken by man contains a good part (*prasāda*) and a waste part (*kitta*). The former is assimilated by the system and turned into chyle (*rasa*), which, in its turn, serves to build up the various parts of the body (blood, muscles, bones, &c). The latter is secreted by the body as its waste products (*mala*), the nails, in particular, being secreted by the bones.

three joints (*parvan*) Hence, as there are twenty fingers and toes, there are sixty bones in the joints As to the third joint of the thumb and great toe, it must be understood to be contained within the respective hand or foot The long bones (*śalākā*), too, of the thumb and great toe, must be understood to be of small size The place where the long bones of the fingers and the toes meet, there is their base (*adhīsthāna*) The word "knee" (*jānu*) signifies the knee-cap (*jānuḥ*), marking the articulation of leg and thigh The "two collar-bones" (*aśśaka*) are the two pegs that run athwart the anterior part of the trunk between the articulations of the shoulder and the throat¹ The two "palatal cavities" (*tālūśaka*) signify the two palatal bones The "pubic bone" (*bhagāsthī*) is the cross (*trīyag*) bone that serves to compact the two hip-bones in front By the term "sockets" (*sthālakā*) are meant the shallow (*nūma*) bases for the ends of the ribs, and by the words "tubercles fitting into the sockets" (*sthālak-ān budāni*) are meant the tubercle-like bones which occur in the middle between the ribs and the shallows The "nose" (*nāsikā*), the "prominences of the cheeks" (*gandakūta*), and the "brows" (*lalāṭa*) must be taken together, and counted as a single bone According to those who read the three items separately, the nose, the prominences of the cheeks, and the brows constitute three distinct bones, but in this way the total [360] does not work out'

3 The main interest of this commentary lies not so much in the explanations which it gives of the several items of the list of bones, as in the evidence it affords of the state of the text of Charaka in the eleventh century The value of the explanation is much impaired by its apparently fragmentary character Out of the thirty items in the list of Charaka (§ 4), it comments only on twelve (viz Nos 1-6, 12, 17, 19, 21, 25 *a, b, c*, 28) For no less than eighteen items (Nos 7-11, 13-16, 18, 20, 22-4, 26, 27, 29, 30) we have no comment, and as there are among them some not quite transparent terms (e g Nos 9, 13, 18, 27), it is difficult to avoid the suspicion that the text of the commentary has not been preserved intact

¹ The original of this clause is very corrupt it has been conjecturally restored, its general purport seems clear enough—*Kośṭha* signifies the whole of the anterior part of the trunk, as opposed to *prsthā*, or the whole of the 'back', or posterior part The articulations referred to are the scapulo-clavicular (*amsa*) and the sterno-clavicular (*jatru*, see § 62)

4 Regarding the evidence on the condition of the text of Charaka's statement, the fortunate preservation of Chakrapānidatta's gloss on No 19, *tālūśake*, shows the misplacement of that item as already extant in his time. The extreme antiquity, indeed, of this particular misplacement, as has already been pointed out in § 5, is guaranteed by its occurrence in the Non-medical Version, as well as in the Medical Version of Bheda (§ 12). In default of any gloss on No 18, *gatin*, and No 23, *grīvā*, it must remain uncertain, whether they were misplaced in Charaka's text as Chakrapānidatta saw it, or whether he read them in their right position as shown in the Non-medical Version (§ 16). Again the commentary's silence on No 9, *manika*, No 13, *jānu-kapāhka*, and No 16, *amsa*, leaves it also uncertain how far Chakrapānidatta's text may have supported the emendations suggested in § 6.

5 Of great importance is the remark of Chakrapānidatta on No 28, the complex bone of nose, cheeks, and brows. For, first, it shows that he must have read Charaka's text as given in Jivānanda's recension, and that, accordingly, Gangādhara's recension is not genuine. For the latter breaks up the complex into three parts, and makes each part to consist of two bones. Its procedure, therefore, results in producing a total of six bones, where the genuine recension has only a single bone, and where even the rival text, which Chakrapānidatta mentions, has no more than three bones. Secondly it renders it very probable, that when speaking of this rival text, Chakrapānidatta was referring to the Medical Version as traditionally presented in the Compendium of Bheda. For that Version (§§ 12, 13) makes No 28 to consist of three bones, and consequently works out a wrong total (362).

§ 12 *The Medical Version according to Bheda*

1 As stated in § 1, Ātreyā's theory of the skeleton is found also in Bheda's Compendium (*Bheda Samhitā*). Of this compendium, at present, no more than a single manuscript is known to exist, dated about 1650 A D, and preserved in the Palace Library

in Tanjore (Bunnell's Catalogue, No 10773)¹ The arrangement of the Compendium of Bheda agrees with that of the Compendium of Charaka Accordingly his statement on the bones of the human body is also found in the seventh chapter of the Anatomical Section (*Śārīra Sthāna*) It runs as follows (Original Text in § 76)

2 'There are three hundred and sixty bones These are the following

- 1 32 teeth (*danta*)
- 2 32 sockets (*ulūkhala*) of the teeth
- 3 20 nails (*nakha*)
- 4 60 phalanges (*anguli*)
- 5 20 long bones (*śalākā*) of the hands and feet
- 6 4 bases (*adhīsthāna*) of the long bones
- 7 2 heels (*pāṇi*)
- 8 4 ankle-bones (*gūlpha*) of the two feet
- 9 2 wrist-bones (*manika*) of the two hands
- 10 4 bones of the two forearms (*aratni*)
- 11 4 bones of the two legs (*jangha*)
- 12 2 knee-caps (*jānu*)
- 13 2 elbow-pans (*jānu-kapālākā*)
- 14 2 hollow bones (*nalaka*) of the two thighs (*ūru*)
- 15 [2 hollow bones (*nalaka*) of the two arms (*bāhu*)]
- 16 a 2 shoulders (*amsa*)
- 16 b 2 shoulder-blades (*amsa-phalaka*)
- 17 2 collar-bones (*aksaka*)
- 18 1 windpipe (*jatrū*)
- 19 2 palatal cavities (*tāl-ūśaka*)
- 20 2 hip-blades (*śroni-phalaka*)
- 21 1 pubic bone (*bhag-āsthī*)
- 22 45 back-bones (*pīṣṭha-gat-āsthī*)
- 23 15 neck-bones (*grīvā*)
- 24 14 breast-bones (*mas*)

¹ Of this MS I possess an excellent copy in Telugu, which I owe to the munificence of the Government of Madras, by whose orders it has been prepared for me (November, 1905) Dr P Cordier also possesses two copies, one in Telugu, the other in Devanagari, the latter being a transcript from his Telugu copy (information by letter of September 10, 1904, see also *Récents Découvertes*, pp 4, 5) Professor Aufrecht's *Catalogus Catalogorum*, vol 1, p 416, notices another MS, 'Radh 32,' in a native library in Lahore, but the existence of it at present lacks verification

- 25 a 24 ribs (*pāśāka*)
 25 b 24 sockets (*sthālika*) in the two sides.
 25 c 24 tubercles (*arbudā*) fitting into the sockets
 26 1 (lower) jaw-bone (*hanu-asthi*), or chin
 27 2 basal tie-bones of the jaw (*hanu-mūla-bandhana*)
 28 a 1 nasal bone (*nās-asthi*)
 28 b 1 bone in the prominences of the jaw (*hanu-kūta*)
 28 c 1 bone in the brows (*lalāta*)
 29 [2 temples (*śankha*)]
 30 4 cranial pan-shaped bones (*śīrsa-kapāla*)'

§ 13 *Peculiarities and Defects of Bheda's Statement*

With reference to the condition of the text of the statement of Bheda the following points deserve notice

1 Nos 15 and 29, which are enclosed in angular brackets, are missing in the original Sanskrit text (§ 76) That these omissions are due to clerical lapses in the existing MS is obvious from the fact that otherwise the required total (360) does not work out Accordingly in the list (§ 12) they have been supplied

2 In No 28 b, Bheda's text has the peculiar reading *hanu-kūta*, prominence of the jaw, where Charaka's text (§ 4) has *ganda-kūta*, prominence of the cheek It will be shown in § 65 that though both terms may well be synonymous, the term *hanu-kūta* is really inconsistent with the system of Ātreya. It is not improbably, therefore, a false reading for *ganda-kūta*

3 In the original text (§ 76) the statement appears to contain two additional items, which have been omitted in the translation (§ 12) In reality these additions are merely explanatory (marginal) glosses which have become wrongly incorporated into the text First, No 9, in the original text, runs as follows 'two *manika*, two *pānika*, of the two hands' Here the two words *manika* and *pānika*, are simply synonyms, explanatory of each other, and either *manika* or *pānika* is the intrusive gloss, more probably, to judge from its secondary position, the latter. In the India Office MS, No 881 (Cat No 2640), the word *pānike* is actually substituted for *manike* Secondly, in No 19, the original text has 'two *tālāsaka*, two *cubuka*' Here, probably,

there has occurred a misplaced insertion of the gloss *cubuka*. That word means 'chin', and probably served as a marginal gloss to explain the term *hanv-asthr* (No 26). By some mischance or misunderstanding it got misplaced, and was then wrongly inserted into the text after *tālūsaka* (No 19). Both *hanvasthr* and *tālūsaka* are very unusual terms, and the transfer of the gloss *cubuka* from one to the other is readily intelligible in the hands of an ignorant scribe.

4 There is a difficulty with respect to the total of the listed bones. According to the introductory clause of the list, its total should be 360, but the addition of its items actually works out a total of 362. It is obvious that there must be a defect somewhere in the list. The probability, as will be shown in the sequel (§ 66), is that the defect lies in No 28 *a, b, c*. The real text of the clause expressing that item must have run similarly to that in the list of Charaka (§ 4), and instead of a nasal bone, and a bone for the prominences of the jaw and of the brows respectively (i.e. three bones altogether), it must have spoken of but one bone, that is, a single complex bone, including all three organs—nose, prominences, and brows. With this correction we obtain the correct total 360.

5 It is probable, however, that a further correction should be made. It will be noted that all the inconsistencies and corruptions, noticed in the case of the list of Charaka (§§ 5, 6), occur also in the list of Bheda. Accordingly, just as in the list of Charaka, No 16 *a*, *amsa*, shoulders, should be omitted, and on the other hand, in No 9, 'four wrist-bones' should be read instead of 'two wrist-bones'. The total 360 thus remains untouched.

§ 14 *Non-medical Version of Ātreya's System*

1 The existence of a Version of the theory of Ātreya on the skeleton in some works of a non-medical character has been referred to in § 1. This Non-medical Version is found in two legal and two religious text-books. The former are the Law-book of Yājñavalkya (*Yājñavalkya Dharma-sāstra*) and the Institutes of Vishnu (*Viṣṇu Smṛiti*). The latter are the Vishnu

Dharmottara (*Viṣṇu-dharmottara*) and the Agni Purāṇa (*Agni Purāṇa*)

2 The Law-book of Yājñavalkya is a versified treatise of Hindu law, the approximate date of which is about the middle of the fourth century A D¹

3. The Institutes of Viṣṇu, on account of its being partly written in prose, is supposed to belong, at least in its original form, to a considerably earlier date, but in its final redaction, it is placed (by Professor Macdonell) 'not earlier than 200 A D.', or (by Professor Jolly) 'in the third or fourth century A D.'² But it is probable that isolated portions have been interpolated into the work at much later dates. In any case, in respect of the passage containing the Non-medical Version of the skeleton, there is sufficient evidence (§ 22) proving that it cannot have existed in the Institutes of Viṣṇu before the twelfth century A D. Indeed, the very fact that the passage is in no way required by its context, suggests its being a much later otiose amplification, interpolated into the text from some other work. The surmise is confirmed by the fact that the passage in question is not found in all MSS of the Institutes. On this point I have been able to test the following seventeen MSS.³

- 1 India Office, No 915 (Cat 1342 = Jolly V¹)⁴
- 2 " " No 1545 (Cat 1345 = Jolly V²)⁴
- 3 " " No 1247 (Cat 1347 = Jolly V³)
- 4 " " No 540 (Cat 1341 = Jolly V)
- 5 " " No 200 (Coll Buhler = Jolly V⁴)⁴

¹ See Professor Jolly's *Recht und Sitte*, p 21, in the Cyclopaedia of Indo-Aryan Research, and Professor Macdonell's *Sanskrit Literature*, p 429

² Professor Macdonell, *ibid*, p 428, Professor Jolly, *ibid*, p 7, also in *Sacred Books of the East*, vol vii, Introduction, p xxxii

³ The first five MSS were used by Professor Jolly in his edition in the Bibliotheca Indica. The first six MSS have been examined by myself, so also extracts from Nos 13-17, kindly supplied to me by Mahamahopadhyāya Hara Prasāda Shastri. For the examination of No 7 I am indebted to the kindness of Rao Bahadur M Rangachariya, of Nos 8 and 9 to that of Professor S K Bhandarkar, of Nos 10-12 to that of Professor K B Pathak

⁴ Nos 1, 2 and 5 are provided with Nanda Pandita's Commentary

- 6 India Office, No 913 (Cat 1340)
- 7 Government Oriental Library, Madras, No 87
- 8 Elphinstone College, Bombay, No 162 (Coll Buhlei)
- 9 " " " No 174 (Coll Buhlei)¹
- 10. Deccan College, No 19 (Bhandarkar's Report, 1880)
- 11 " " No 20 (Bhandarkar's Report, 1882)
- 12 " " No 155 (Peterson's Report, III)
- 13 Calcutta, Sanskrit College, No 5
- 14 " " " No 62¹
- 15 Asiatic Society of Bengal, No II A 10
- 16 " " " No II A 11
- 17 " " " No II B 25¹

From among these MSS, twelve (Nos 1, 2, 4-9, 13-15, 17) contain the passage in question, while five (Nos 3, 10-12, 16) do not contain it. It appears to be generally assumed, on the authority of Max Muller,² that the Law-book of Yājñavalkya borrowed the passage from the Institutes of Vishnu. The evidence which will be adduced in § 22, goes to show that the truth is rather the reverse. The passage, most probably, was inserted into the Institutes by some one who was familiar with the Mitaksharā commentary on the Law-book. This must have happened at a comparatively late date, though at least some time before 1622 A D. For Nanda Pandita, who wrote his *Vayavyantī* commentary on the Institutes in that year,³ comments on the passage.

4 The Vishnu Dharmottara is held to be a part of the Gaṇḍa Purāṇa. Its existence as early as about 1100 A D is guaranteed by a quotation in the *Dānasāgara*, a work ascribed to King Ballāla Sena of Bengal, who reigned about that time. Numerous detached portions of the work are known to exist. Among these there is one called 'the Chapter on Anatomy' (*Śārīrādhyāya*), of which the Tübingen University Library possesses a unique MS, M a I 483 (Cat No 167).⁴ The treatise, thus called, professes to be a versified compilation from

¹ Nos 9, 14 and 17 are provided with Nanda Pandita's Commentary

² *Sacred Books of the East*, vol VII, Introduction, p xx

³ Professor Jolly's edition, Pref, p 1, and his translation, Introd, p xxviii

⁴ Through the liberality of the authorities of the Library who loaned it to me, I was enabled carefully to examine it

the Compendia of Charaka and Suśruta Its statement on the skeleton, however, is a literal extract from the Law book of Yājñavalkya

5 The date of the Agni Purāṇa is not known, but the point is of small interest, for there can be no doubt that the 369th chapter, entitled 'the Parts of the Human Body' (*Śāṇḍilya-āyāvalī*), in which the statement on the skeleton occurs, is not a portion of the original work. A comparison of it with the 'Chapter on Anatomy' in the Vishnu Dharmottara Purāṇa shows that about two-thirds of its contents (i.e. twenty-nine out of a total of forty-three verses) are literally plagiarized from it. Moreover, it betrays itself as a later interpolation by its very position in the book, occurring as it does after chapters 367 and 368 which treat of the Dissolution of the World (*malaya*), and before chapter 370 which treats of the various hells (*naraka*), while its proper place would have been with chapters 278-85 which treat of Medicine¹. A further corroborative evidence is the fact that it is wanting in many MSS. The Bibliotheca Indica edition (as stated in its Preface, p. ii, and Introd., p. xxxvii) is based on ten MSS.² Out of these, eight MSS. appear to have contained the chapter in question, while it was wanting in two. To these two must be added the India Office MS., No. xxv (W. 4), and the Bodleian Library MS., No. 42, which I have examined myself, and neither of which contains the chapter. Neither is it contained in the two MSS. of the Asiatic Society of Bengal, No. III H. 38 and No. III G. 31, which have been collated for me in Calcutta. This gives eight MSS. for, and six against the originality of the chapter. As one of those

¹ These chapters profess to give Suśruta's system of medicine. But there is very little distinctly Suśrutian to be found in them, nor, for that matter, anything more distinctly Charakian. A good test case is the half-verse 8, on p. 29, in chapter 278, which agrees with neither Charaka (ed. 1896, p. 479) nor Suśruta (p. 824) nor Vāgbhata. On the other hand, two verses (13 and 14 on p. 35 in chapter 279) of an incantation are found also in Suśruta (*Sūtra Sthāna*, 44th *adhyāya*, p. 160).

² The editor had eleven MSS., but he discarded one at an early stage. One of his MSS. is now in the India Office, No. 5 (7) of the Samendra Mohun Tagore Collection. The statement on the skeleton is found on fol. 115 b, ll. 2 ff.

eight MSS is dated in śaka 1595, i.e. A.D. 1673 (Ed., p. 11), it follows that the interpolation of the chapter goes back, at least, to the middle of the seventeenth century.

§ 15 *The Recensions of the Non-medical Version*

1 The evidence given in the preceding paragraph renders it practically certain that the Law-book of Yājñavalkya is the original source of the Non-medical Version, from which it passed into the Institutes of Vishnu, and into the two Purāṇas. With regard to the two latter, there can be no doubt on this point, seeing that their versified statements of the Non-medical Version (original Texts and Translations, in § 86) are mere copies of the versified statement in the Law-book of Yājñavalkya. The case of the Institutes of Vishnu might at first seem doubtful because of its statement of the Non-medical Version being in prose, while that in the Law-book is in verse. But it will be shown in § 22 that, while in essentials the two statements are identical, their points of difference indicate that the author of the statement in the Institutes of Vishnu must have been familiar with the statement in the Law-book of Yājñavalkya. The fact, therefore, of his making his statement in prose and in very concise terms must be explained by his desire to write it in conformity with the general character of the diction of the Institutes.

2 On account of their essential identity, the four examples may be considered to represent a single recension of the Non-medical Version, of which the example contained in the Law-book of Yājñavalkya forms the representative type. As such the latter will be treated in the sequel of the present dissertation. There exists, however, a rather different recension of the Non-medical Version—differing in essential points regarding terminology as well as numeration—in the commentary of Gangādhara which accompanies his edition of Charaka's Compendium (*Śārṅga Sthāna*, pp. 187, 188). It becomes necessary, therefore, again to inquire into the evidence of the genuineness of the two recensions. Briefly stated, the case is similar to that of the two recensions of the Medical Version in Charaka's Compendium.

For the recension of Gangādharī there exists—so far as my knowledge goes—not a single MS authority, while all MSS. that I have been able to examine, and all old commentaries, at present known, support the recension as given in the published editions of the two legal treatises and the Agni Purāna¹ These are Professor Stenzler's edition of the *Yājñavalkya Dharmaśāstra* (London, 1849), verses 84–90 of the third chapter (*adhyāya*), on pp. 89, 90 (translated on pp. 98, 99), Professor Jolly's edition of the *Vishnu Smṛiti* in the Bibliotheca Indica (Calcutta, 1881), clauses 55–79 of the 96th section, on pp. 196, 197 (translated in the *Sacred Books of the East*, vol. vii, pp. 283–5), Dr Rajendralal Mitra's edition of the *Agni Purāna*, in the Bibliotheca Indica (Calcutta, 1879), verses 27 b–33 of the 369th chapter, on pp. 308–9 of the third volume. The MSS (twelve and eight respectively) which support the published recensions contained in the Institutes of Vishnu and the Agni Purāna have been already enumerated in the preceding paragraph. It remains to enumerate the MSS of the Law-book of Yājñavalkya which I have examined. There are fifteen of these, and they all support the published recension. They are the following:

- | | | |
|--------|--------------------------------------|-------------------------------------|
| 1 | India Office, No 1079 | } with the Mitaksharā
commentary |
| 2 | „ No 2035 | |
| 3 | „ No 2060 | |
| 4 | „ No 3022, | with Aparārka's commentary |
| 5 | „ No 1278, | with Śūlapāni's „ |
| 6 | „ No 1176, | with Mitra Miśra's „ |
| 7–10 | „ Nos 1786, 2074, 2167, 2823 | |
| 11. | „ No 23 (50), | S M Tagore Collection |
| 12 | Bodleian Library, No 55 | |
| 13 | Asiatic Society of Bengal, No 1 B 51 | |
| 14, 15 | „ „ „ | No II A 10, 11 |

3 Of old commentaries on the Law-book of Yājñavalkya we have four². The oldest is the Mitaksharā (*Mitākṣarā*) written

¹ The statement in the Vishnu Dharmottara Purāna has not yet been published.

² There exists a fifth commentary by Viśvarūpa, which is still older than the Mitaksharā, and has been described by Professor Jolly in the *Nachrichten der K. Gesellschaft der Wissenschaften zu Göttingen*, 1904, Heft 4. Only one MS of it appears to be known, which, however, is not accessible to me.

by Viṇṇāneśvara (*Vyñāneśvara*), who lived about 1100 A D A near contemporary of his is Aparāika or Aparāditya, who wrote his commentary about 1150 A D Rather later comes Śūlapāni in the fifteenth, and Mīṭha Mīṣa in the seventeenth century A D¹ The latter two commentators follow the lead of the Mitaksharā, while Aparāika, in many points, takes a line of his own, but all four comment on a text which was identical with the published recension

4 On the Institutes of Vishnu we have the commentary of Nanda Pandita, called *Vaṇṇyaṇṭī*, which was written in 1622 A D,² and which supports the published recension of the text

§ 16 *The Genuine Recension of the Non-medical Version*

The genuine Non-medical Version, as it is found in the Law-book of Yājñavalkya, in its third chapter, verses 84-90, runs as follows (Original Text in § 77)

‘(In the body) there are six parts (*anga*), and of bones there are in it three hundred and sixty, namely

- | | | |
|------------|----|---|
| [Verse 85] | 1 | 64 teeth (<i>danta</i>) with their sockets (<i>sthāla</i>). |
| | 2 | 20 nails (<i>nakha</i>) |
| | 3 | 20 long bones (<i>śalākā</i>) of the hands and feet. |
| | 4 | 4 bases (<i>sthāna</i>) of the long bones |
| [Verse 86] | 5 | 60 phalanges (<i>anguli</i>) |
| | 6 | 2 heels (<i>pāśu</i>) |
| | 7 | 4 ankle-bones (<i>gulpha</i>) |
| | 8 | 4 bones of the forearms (<i>aratni</i>) |
| | 9 | 4 bones of the legs (<i>jangha</i>) |
| [Verse 87] | 10 | 2 knee-caps (<i>jānu</i>) |
| | 11 | 2 elbow-pans (<i>lapola</i>) |
| | 12 | 2 thighs (<i>ūru-phalaka</i>) |
| | 13 | 2 shoulder-blades (<i>amsa-samudbhava</i>) |
| | 14 | 2 collar-bones (<i>aḥsa</i>) |
| | 15 | 2 palatal cavities (<i>tālūsaka</i>) |
| | 16 | 2 hip-blades (<i>śroni-phalaka</i>) |

¹ See Professor Jolly's *Recht und Sitte*, p 33, in the Cyclopaedia of Indo-Aryan Research

² For the date, see Professor Jolly's edition, Preface, p 1, also his Translation, in the *Sacred Books of the East*, volume vii, Introduction, p xxxiii

- [Verse 88] 17 1 pubic bone (*bhag-āsthā*)
 18 45 back-bones (*prsthā*)
 19 15 neck-bones (*gīṛvā*)
 20 1 windpipe (*gatrū*)
 21 1 (lower) jaw-bone (*hanu*), or chin
 [Verse 89] 22 2 basal bones of the jaw-bone (*hanu-mūla*)
 23 a 3 bones constituting brows, eyes, and cheeks,
 (*lalāt-ākṣi-gandā*)
 23 b 1 nasal bone (*nāsā*) called *ghana*
 24 72 ribs (*pāṇḍvaka*) with their sockets (*sthūlaka*)
 and tubercles (*arbuda*)
 [Verse 90] 25 2 temporal bones (*śankhaka*)
 26 4 cranial pan-shaped bones (*śiṃśh-kapāla*)
 27 17 breast-bones (*uras*)

These bones make up the skeleton of man '

This list works out the correct total 360

§ 17 *Merits, Defects, and Peculiarities of the Non-medical Version*

1 As has already been pointed out in §§ 5, 6, the advantage of the Non-medical Version for text-critical purposes is that it confirms the corrections suggested in those paragraphs For

(a) It places the organs of the neck, that is, No 19, neck-bones (*gīṛvā*), and No 20, windpipe (*gatrū*), in their proper place in connexion with, and immediately before, the bones of the head

(b) It avoids the reduplication of the words *amsa* in connexion with No 13, and *gānu*, in connexion with No 11

2 On the other hand, the Non-medical Version has three defects, namely

(a) It places No 24, the ribs together with their sockets and tubercles, in the midst of the bones which belong to the head

(b) It also places No 27, breast-bones (*uras*), at the end of the whole list, that is, practically along with the bones of the head

(c) The preceding two defects are mere misplacements, but the most serious defect of the Non-medical Version is that it entirely ignores the two bones of the arms (*bāhuv*) and the

four bones of the wrists (*manika*) These bones, as a reference to the lists of the Medical Versions of Charaka (§§ 4, 7) and Bheda (§ 12) shows, should have been enumerated between Nos 7 and 8, and Nos 12 and 13 respectively

3 Further, the Non-medical Version has three peculiarities, namely:

(a) It uses the peculiar term *amsa-samudbhava*, sprung from the shoulder, to denote the shoulder-blade, instead of the term *amsa-phalaka* of the Medical Version (No 16 *b* in §§ 4, 12)

Of far greater importance than this verbal difference are the following two

(b) In No 27 it counts seventeen breast-bones, instead of the fourteen of the Medical Version (No 24 in §§ 4, 12)

(c) In No 23 *a* it adds the eyes to the brows and cheeks, which alone are named in the Medical Version (No 28 in §§ 4, 12)

4 With regard to the third peculiarity the following point is to be noted The Medical Version, as preserved by Charaka, counts a single bone for the complex of nose, cheeks, and brows (No 28 in § 4) But there existed, as Chakrapānidatta tells us (§ 11), another view, presented in Bheda's Compendium (§ 12), according to which the Medical Version is interpreted as counting three bones, that is, one for each of the three items nose, cheeks, brows By adopting this rival view, and adding the eyes as a fourth item, the author of the Yājñavalkyan Law-book obtained four bones (Nos 23 *a, b*) against the single bone of the Medical Version, that is, he obtained three extra bones Similarly by his counting seventeen breast-bones against the fourteen of the Medical Version, he obtained another three extra bones Thus both operations together gave him six extra bones The rationale of his procedure is now obvious its intention is to correct the shortage of six bones caused by the omission of the arms and wrists, as thus

Required total	. 360
Omitted 2 arms, 4 wrist-bones	6
Balance	354
Add 3 breast-bones and 3 facial bones	6
Total	360

It may be particularly noted that this corrective result affords a strong confirmation of the suggestion, put forward in § 6, that the true number of the bones of the wrists is four, not two, as the traditional list of Charaka (§ 4) now has it

5 With regard to the source from which the Non-medical Version derived its peculiarities, it will be shown in the sequel (§§ 29, 30, 33) that it was, in all probability, the statement of Suśruta on the bones of the human body

§ 18 *Gangādhara's Recension of the Non-medical Version*

In his commentary on Charaka's Compendium, in illustration of the statement of Suśruta (§ 27) that the professors of General Medicine hold the number of bones to be 360, Gangādhara quotes the Non-medical Version, as he states himself, from the Law-book of Yājñavalkya and the Agni Purāṇa. As given by him, that Version is not quite easy to follow, but it would seem to yield the following list, which works out the required total of 360 (Original Text in § 78)

- | | | |
|------------|------|---|
| [Verse 85] | 1 | 64 teeth (<i>daśana</i>) with their sockets (<i>sthāla</i>) |
| | 2 | 20 nails (<i>nakha</i>) |
| | 3 | 20 long bones (<i>śalākā</i>) |
| | 4 | 4 bases (<i>sthāna</i>) of the long bones |
| [Verse 86] | 5 | 60 phalanges (<i>anguli</i>) |
| | 6 | 4 heels (<i>pārsni</i>) |
| | 7 a | 4 wrist-bones (<i>manika</i>) |
| | 7 b | 4 ankle-bones (<i>gūlpha</i>) |
| | 8 | 4 bones of the forearm (<i>aratni</i>) |
| | 9 | 4 bones of the legs (<i>jangha</i>) |
| [Verse 87] | 10 | 2 knee-caps (<i>jānu</i>) |
| | 11 | 2 elbow-pans (<i>kūrpara</i>) |
| | 12 | 2 thighs (<i>viru-phalaka</i>) |
| | 13 | 2 shoulder-blades (<i>amsa-samudbhava</i>) |
| | 14 | 2 collar-bones (<i>aksaka</i>) |
| | 15 | 2 palatal cavities (<i>tālūśaka</i>) |
| | 16 | 2 hip-blades (<i>śroni-phalaka</i>) |
| [Verse 88] | 17 | 1 pubic bone (<i>bhag-āsthā</i>) |
| | 18 a | 1 sacral bone (<i>triṅka</i>) |
| | 18 b | 1 anal bone (<i>pāyu</i>) |
| | 18 c | 35 back-bones (<i>prsthā</i>). |

¹ These two items of bones are stated in Gangādhara's list to be situated 'below the clusters' (*kūrca*)

	19	15 neck-bones (<i>grīvā</i>).
	20	2 collar-bones (<i>gātru</i>)
	21	1 (lower) jaw-bone (<i>hanu</i>) or chin
[Verse 89]	22	2 basal bones of the jaw (<i>hanu-mūla</i>)
	23 a	6 bones constituting brows, eyes, and cheeks (<i>lalāt-ākṣi-ganda</i>)
	23 b	1 nasal bone (<i>nāsā</i>) called <i>ghana</i>
	24	72 ribs (<i>pārśvaka</i>) with their shallow sockets (<i>sthāla</i>) and tubercles (<i>arbuda</i>)
[Verse 90]	25	2 temporal bones (<i>śankhaka</i>)
	26	4 cranial pan-shaped bones (<i>śiṣa-kapāla</i>).
	27.	15 breast-bones (<i>vas</i>)

§ 19 Criticism of Gangādhara's Recension

1 At the end of the Non-medical Version, as given by him, Gangādhara adds the remark 'this is the statement found in the *Agneya Purāṇa* and in the *Yājñavalkya Samhitā* Law-book' As a fact, however, it is not a real quotation that he gives, but an 'edited' recension of the statement. For his recension differs considerably in several points from the traditional recension in the Law-book

(a) In No. 6 Gangādhara counts four heels instead of two

(b) In No. 18 c he counts thirty-five back-bones instead of forty-five

(c) In No. 20 he counts two *gātru* (collar-bones) instead of one (windpipe)

(d) In No. 23 a he counts six bones instead of three

(e) In No. 27 he counts fifteen breast-bones instead of seventeen

(f) In No. 7 a he inserts four wrist-bones

(g) In Nos. 18 a, b he inserts a sacral and an anal bone

2 Among these differences, the items c, d, and f enable us to see the reason which led Gangādhara to elaborate his emended recension of the Non-medical Version. We have seen (§ 17) that the traditional Non-medical Version entirely neglects to count the two arms and four wrist-bones. From the fact of Gangādhara counting the four wrist-bones, it is evident that he had noticed the defect of the traditional recension. But it may be asked why he did not also count the two arms. The answer is indicated

by the differences noted in the items *c* and *d*. They show that Gangādhara was acquainted with the interpretation of Vijnāneśvara in his Mitaksharā Commentary (§§ 20, 21) He followed that commentator in including the arms under the term 'forearm' (No 8, *aratni*), also, in taking *jatru* to refer to the two collar-bones, as well as in allotting two bones to each of the three items brows, eyes, cheeks As Vijnāneśvara, however, failed to realize the omission of the four wrist-bones, Gangādhara supplied the deficiency Moreover, he did not follow Vijnāneśvara in discounting the four bases (No 4, *sthāna*) There is, however, still another circumstance that influenced Gangādhara's emended recension, namely, his acquaintance with Suśruta's statement on the skeleton From the traditional recension of that statement (§ 27), he obtained his count of four heels, as well as of the sacral and anal bones

3 The combined result of the two modifying influences was the augmentation of Gangādhara's list by twelve bones And it was to counterbalance this excess that Gangādhara reduced the back-bones by ten, and the breast-bones by two, as thus

Grand total of the Non-medical Version (§ 20, col iv)	360
Add, Two extra heels in No 6	2
Four wrist-bones in No 7 <i>a</i>	4
One extra <i>jatru</i> in No 20	1
Three extra bones in No 23 <i>a</i>	3
One sacral bone in No 18 <i>a</i>	1
One anal bone in No. 18 <i>b</i>	1
	— 12
Total	372
Deduct, Ten back-bones in No 18 <i>c</i>	10
Two breast-bones in No 27	2
	— 12
Balance	360

It seems hardly necessary to point out, and it will be shown in the Third Section, that all this manipulation of the numbers of the list is performed without any reference to, and has no warrant in, the actual state of the skeletal structure.

4 Regarding the influence of the statement of Suśruta on the recension of Gangādhara, another indication of it may be

noted in the latter's employment of the terms *kūca*, cluster (§ 18, footnote), and *kūpara*, elbow-pan (No 11) Both terms are peculiar to the system of Suśruta (§§ 27, 28) The genuine recension of the Non-medical Version does not use the term *kūca* at all, and instead of *kūpara* it uses the term *kapola* (No 11 in § 16) The reason, no doubt, why Gangādhara preferred the Suśrutian term *kūpara* was that he saw that the term *kapola* was misleading It properly signifies the cheek, and is here out of place, because the cheeks are enumerated afterwards under the name *ganda* (No 23 a) The fact is (§ 21, cl 3) that *kapola* is an ancient false reading for *kapāla*, a pan, which signifies the pan-like olecranon process of the elbow (§ 53), and which is used in the Medical Versions of Charaka (§ 4) and Bheda (§ 12) in the slightly modified form of *kapālikā*, a small pan¹

§ 20 *The Commentaries on the Non-medical Version*

1 The commentaries on the Non-medical Version contained in the Law-book of Yājñavalkya throw not a little light on the subject of the defects and peculiarities of that Version The subjoined table exhibits a conspectus of their theories of interpretation Columns I to IV refer to the Law-book itself, and columns V to VIII to the commentaries of Aparārka (V), Vijnāneśvara (Mitaksharā, VI), Śūlapāni (VII), Mitāmisra (VIII) Column III gives the number of bones of each item of the list, and column IV the totals of the bones named in each verse For the original texts and translations of the commentaries, see §§ 79-82

¹ As a fact, the India Office MS, No 540, of the *Viṣṇu Smṛti*, reads *kapāla*, see § 84

I VERSE	II ITEMS OF LIST	III YĀJN	IV YĀJN	V AP	VI VIJN	VII ŚUL	VIII MIT
85	1 Teeth and sockets 2 Nails (<i>nakha</i>) 3 Long bones (<i>śalākā</i>) 4 Bases (<i>sthāna</i>)	64 20 20 4	108	108	104	104	104
86	5 Phalanges (<i>anguli</i>) 6 Heels (<i>pārsni</i>) 7 Ankle-bones (<i>gulpha</i>) 8 Forearms (<i>aratni</i>) 9 Legs (<i>jangha</i>)	60 2 4 4 4	74	74	74	74	71
87	10 Knee-caps (<i>jānu</i>) 11 Elbow-pans (<i>kapola</i>) 12 Thighs (<i>ūru-phalaka</i>) 13 Shoulder-blades 14 Collar-bones (<i>aksa</i>) 15 Palatal cavities (<i>tālūsaka</i>) 16 Hip blades (<i>śroni-phalaka</i>)	2 2 2 2 2 2 2	14	12	14	14	14
88	17 Pubes (<i>bhaga</i>) 18 Back-bones (<i>prsthā</i>) 19 Neck-bones (<i>grīvā</i>) 20 Windpipe (<i>jatru</i>) 21 Chin (<i>hanu</i>)	1 45 15 1 1	63	63	64	64	64
89	22 Basal tie-bones 23 a Bones of brows (<i>lalāta</i>) " eyes (<i>akṣi</i>) " cheeks (<i>ganda</i>) 23 b Nasal bone (<i>nāsā</i>) 24 Ribs, &c (<i>pārśvaka</i>)	2 1 1 1 1 72	78	80	81	81	81
90	25 Temporal bones (<i>śankhu</i>) 26 Cramal pan-shaped 27 Breast-bones (<i>urās</i>)	2 4 17	23	23	23	23	23
	Grand totals		360	360	360	360	360

2 It will be noticed at once that the totals of Aparāṅka (col V) differ from those of the three other commentators (cols VI, VII, VIII). The latter agree among themselves, and a comparison of their comments shows that the views of Vijnāneśvara, who is the oldest among them, have been simply adopted by the two others. Aparāṅka, who was a near contemporary of Vijnāneśvara, holds an independent view, which differs in respect of four of the six totals, viz the first, third, fourth, and fifth. These differences will now be considered *seriatim*.

3 In verse 85, Vijnāneśvara (in his commentary called *Mitākṣarā*) makes the total of the bones to be 104. He arrives at this total by discounting the bases (*sthāna*). According to him the terms *sthāna* (base) and *śalākā* (long bone) refer to the same organ (hand or foot, as the case may be), but describing it from two different points of view. *śalākā* describes the two hands and feet with reference to the total number of their individual bones, which is twenty, while *sthāna* describes them with regard to the four sets into which those twenty bones are divided. Of course, in a mere enumeration of the bones, both terms are not required, and as we are not primarily concerned with any sets they may form among themselves, but only with their number as individual bones, the four *sthāna* (or sets of *śalākā*) are rejected from the count. On the other hand, according to Aparāṅka, the two terms *śalākā* and *sthāna* refer to quite different organs, *śalākā* denoting the long bones (metacarpal and metatarsal), and *sthāna*, the bases of the long bones, that is, the carpus and tarsus, or what Suśruta calls *kūṇca* or cluster of small bones. The reason—a textual one—that led the two commentators to this difference of interpretation, will be found fully explained in an Exegetical Note, § 83. Here it is only necessary to point out that Aparāṅka is correct, for the interpretation of Vijnāneśvara entirely omits from the count two such important organs as the carpus and tarsus. The total of the bones in verse 85, therefore, must be 108, as stated by Aparāṅka.

4 In verse 87, Vijnāneśvara makes the total of the bones to be fourteen, while Aparāṅka counts only twelve. The difference arises from Aparāṅka's taking *akṣa-tālūsaka* (Nos 14, 15)

to be but a single term, and to denote a single bone, that is, a bone situated, as he supposes, 'on the edge of the eye' (*netra-prānta*), there being, of course, two such bones, one on the edge of either eye¹ On the other hand, Vijnāneśvara takes that term to be double, and to denote two distinct bones, namely, *aḥsa* to signify 'the bone between the eye and the ear' (*larna-netrayorimadhye*),² and *tālūsaka* to denote the hard palate (*lākhuda*) In this case, so far as the counting is concerned, Vijnāneśvara, no doubt, is correct Aparārka was probably led to his fanciful interpretation of the single term by the necessity of working out the required grand total of 360 bones But with regard to the meaning of the term *aḥsa*, both of them are wrong That term is merely a shorter form of the word *aḥsaka*, and denotes the collar-bone (§ 55)³

5 In verse 88, Vijnāneśvara makes the total of the bones to be sixty-four, while Aparārka counts sixty-three The difference arises from the fact that Vijnāneśvara counts two *jatru* (No 20), while Aparārka counts but one In this case Aparārka again is right, for Vijnāneśvara commits the mistake of taking *jatru* to mean collar-bone The subject will be fully discussed in the Third Section (§ 62), here it must suffice to point out that Vijnāneśvara's interpretation is in the teeth of the text which he interprets, and which distinctly says that there is but one *jatru*

6 In verse 89, Vijnāneśvara makes the bones amount to eighty-one, while Aparārka counts eighty The difference arises from their counting the bones referred to in the complex term *lalāt-ākṣi-ganda*, brow-eye-cheek (No 23 a), in two different ways Aparārka takes the term to denote one brow, two eyes, and two cheeks, or altogether five bones, while Vijnāneśvara counts two brows, two eyes, and two cheeks, or a total of six bones In this case, both are wrong In the text, that complex term

¹ He evidently takes *aḥsa* to be synonymous with *aḥsi*, eye

² In fact, Vijnāneśvara's *aḥsa* is identical with Aparārka's *aḥsa-tālūsaka*

³ Both Professors Stenzler and Jolly have been misled by the commentaries in their translations 'Schlafen' (*Yagnavalkya's Gesetzbuch*, p 98) and 'lower part of the temples' (*Sacred Books of the East*, vol vii, p 284), so also Mandlik, p 253, has 'temples'

is not qualified by any numeral—a circumstance which indicates that but one bone is reckoned for each of the three items¹ Hence there are no more than three bones in No 23 *a*, and the total of the bones included in verse 89 is really seventy-eight That this is the true interpretation of the text is proved by the fact that it works out the correct grand total 360, as shown in col. IV (also § 16)

§ 21 *Continuation*

1. Regarding the principal defect of the Non-medical Version—its total neglect of the bones of the arms and wrists—it is instructive to note the shifts to which the commentators are put to explain it

2 As to the omission of all mention of the wrist-bones, the commentators do not seem to have realized it at all, for none of them makes any reference to it Gangādhara, as we have seen (§ 19), did realize it, and he, therefore, introduced the wrist-bones (*manika*) in his reconstruction of the Non-medical Version But the early commentators noticed only the omission of the arms—a circumstance, indeed, which cannot surprise us, seeing that the arms form such a conspicuous part of the body But the way in which they deal with the omission is characteristic The only solution of the difficulty which they are able to suggest, consistently with their respect for the integrity of their sacred text, is to declare that the arms (*bāhu*) are virtually included in the term forearm (*anāhni*, No 8) Thus Vijnāneśvara says (see § 80), ‘the bones of the arms, being implied in the term forearm, number four’, and his explanation is unquestioningly adopted by the later commentators, Śūlapāni and Mitra-

¹ That is to say, *ekam*, ‘one in each,’ is to be understood with the clause *lalāt-ākṣi-gande*, but not *dve dve*, ‘two in each,’ as Vijnāneśvara understands His erroneous interpretation has gained such credence that it has actually modified the text of the list in the Institutes of Vishnu (§ 22), and that it has been unquestioningly accepted by the translators of the two legal treatises Professor Stenzler, p 98, ‘an deren Wurzel zwei, ebenso an Stirne, Augen, Wangen,’ and Professor Jolly (*Sacred Books of the East*, vol vii, p 284), ‘there are two (bones) to the forehead, (two) to the eyes, and (two) to the cheeks’

miśra (§§ 81, 82)¹ The total inappropriateness of such an interpretation is obvious, for the entire arm (or upper extremity) consists of three bones, two in the forearm and one in the arm. The total, accordingly, of the bones of the two upper extremities amounts to six. But Vijnāneśvara and his followers do not seem to have been aware of the fact that the forearm contained two bones. This is pretty clear from their comments (see §§ 80-82). Their idea was that each extremity consisted of two bones, arm and forearm, and similarly leg and thigh, each containing a single bone. Anyhow, Aparārka, while giving the same explanation (§ 79), candidly says, 'though the term forearm (*aratni*) does not really include the arm (*bāhu*), yet here, for the sake of securing the number four of the bones, it is so employed' (i.e. as inclusive of the arm). This shift of interpretation necessarily led to another incongruity. If the term forearm (*aratni*) included the arm (*bāhu*), by parity of reason the term leg (*jangha*) must include the thigh (*ūru*). As a matter of fact the commentators do draw that conclusion. Thus Aparārka expressly says (§ 79), 'similarly the word leg (*jangha*) here signifies the whole lower extremity, and hence the bones of the two legs number four'. But he fails to notice that the bones of the thighs are expressly and separately enumerated in verse 87, where accordingly he counts them a second time.

3 The true explanation of the difficulty, of course, must be of a very different kind, and it is one which the text of the Non-medical Version itself suggests with some degree of probability. The place where the mention of the bones of the arms and wrist-bones would come in is verse 87. Now the wording of that verse is marked by some peculiarities. It runs as follows:

*dve dve jānu-kapol-oruphalak-āmsa-samudbhavā
akṣa-tālūśake śronphalake ca vimirdiśet ||*

Literally this means 'two (bones) each in the knees, cheeks, thigh-blades, and in what springs from the shoulder, also, (as) one

¹ Also Nanda Pandita adopts it in his commentary on the *Viśnu Smṛti* (§ 85).

should declare, in the collar-bones, palatal cavities, and hip-blades' Here the item 'cheeks' is utterly out of place, occurring as it does between the knees and thighs To any one conversant with the skeletal structure it must be obvious that words meaning elbow and arm should have their place there, and there can be no doubt whatever that *kapola* is simply an ancient misleading for *kapāla*, elbow-pan¹ Gangādhara recognized the truth, and hence in his reconstruction of the Non-medical Version (§ 19, cl 4) he substituted the correct synonym *kūrpara* There is another ancient misreading in the term *ūru-phalaka*, thigh-blade, for *phalaka* denotes a broad, flat bone, and is quite inappropriate as a descriptive of the thigh-bone The true reading, of course, must be *nalaka*, which signifies a cylindrical, hollow bone, and which occurs, in this connexion, in the Medical Versions of Charaka and Bheda (§§ 4, 12) Very striking is the use of the otiose phrase 'one should declare' in the midst of a statement packed as concisely as possible with the details of a long enumeration It clearly suggests that it is inserted as mere padding to fill up an awkward lacuna Yājñavalkya, or whoever was the author of the Non-medical Version, must have had a defective MS copy of the Medical Version to work with There were false readings in it (*kapola*, *ūru-phalaka*) as well as lacunae (arms and wrist-bones) As he was unable to supply the lacunae, he had recourse to padding The use of the curious term *amsa-samudbhara*, springing from the shoulder, to denote the shoulder-blade, is perhaps due to the same need of padding For though it is not a false descriptive, it is a needlessly long substitute for the shorter terms *amsa-ja* or *amsa-phalaka* In addition to padding, however, the author had also to make good the shortage of six bones caused by the omission of the arms and wrist-bones This he did, as shown in § 17 (p 48), by augmenting the number of the breast-bones and facial bones by three bones each, or a total of six bones We have here a case of ill-instructed 'editing' of a medical text similar to

¹ Accordingly, the translation 'Backen' by Professor Stenzler (p 98) and 'cheek' by Professor Jolly (*Sacred Books of the East*, vol vii, p 284) should be replaced by 'Elbogenknochen', and 'funny-bone' or 'crazy-bone' respectively

that from which the texts of Charaka and Suśruta suffered recently at the hands of Gangādhara (§§ 9, 35), and anciently at the hands of Vāgbhata I (§ 40)

§ 22 *The Non-medical Version of the Institutes of Vishnu*

1 The essential identity of the Non-medical Version, as it is found in the Institutes of Vishnu, with the same Version as it occurs in the Law-book of Yājñavalkya, is shown by the fact that it also omits all mention of the arms and wrist-bones, and that it also corrects the resulting shortage of six bones by a corresponding increase in the number of bones of the breast and face, as explained in § 17 (p 48)

2 On the other hand, there are significant points of difference. These will be enumerated with reference to the table given in § 20.

(a) The list in the Institutes omits No 4, bases (*sthāna*), altogether

(b) In No 20 it counts two *gatrū* or collar-bones

(c) In No 23 *a* it counts two bones for each of the three items brows, eyes, cheeks, that is a total of six bones

Referring to column VI of that table, it will be seen that these three points of difference exactly reflect the interpretation which Vijnāneśvara, in his Mitaksharā Commentary, places on the statements of the Law-book of Yājñavalkya. According to him, the item 'bases' (*sthāna*) is practically superfluous, accordingly the Institutes of Vishnu omits that item altogether. Again, Vijnāneśvara takes *gatrū* to mean collar-bone, and counts two of them, in spite of the plain statement of the text that there is only one *gatrū* the Institutes, as interpreted by Nanda Pandita, follows suit. Once more Vijnāneśvara counts two brows, two eyes, and two cheeks the Institutes does the same, and in fact actually introduces the number two (*dve*) into the text (p 56, footnote). The conclusion from this remarkable agreement is unavoidable that whoever drew up the list as we find it in the Institutes, did so on the basis of Vijnāneśvara's interpretation, and that accordingly the introduction of that list in the Institutes

cannot be placed earlier than the date of Vijnāneśvara, that is after 1100 A D (§ 14) Seeing that the Institutes of Vishnu appears to be often quoted in the Mitaksharā,¹ it does not seem impossible that the appearance of the list in the Institutes is due to Vijnāneśvara himself

3 In connexion with the late date of the introduction of the Non-medical Version into the Institutes of Vishnu, it is instructive to note the attempts that have been made, in some manuscripts of that work, to amend the text so as to remedy the great defect of the omission of the arms As to the omission of the wrist-bones it appears never to have been realized by any one, copyist or commentator Among the seventeen MSS enumerated in § 14, there are four, Nos 4, 12, 13, 17 (see § 84), which offer a curiously emended text They omit the clause referring to the thighs and shoulder-blades (*ūro-'msayoh*, No 66 in Professor Jolly's edition, and Nos 12, 13 in the table in § 20), and instead of the clause referring to the long bones (*pāni-pāda-śalākāś-ca*, No 59 in the edition, and No 3 in the table) they substitute the clause 'two arms, two forearms, two thighs' (*dve bāhū, dve prabāhū, ūru-drayam*) But this emendation is no real improvement, for though it introduces the arms (*bāhū*), and retains the thighs (*ūru*), it eliminates the shoulder-blades (*amsa*), and reduplicates the forearms (*prabāhū*) which had already been mentioned under the term *aratni* (No 63 in the edition, and No 8 in the table)² But though the emendation is not a success, it at all events proves that the text of the Institutes, so far as the list of the bones is concerned, was not considered too sacred to be altered In the case of the Law-book of Yājñavalkya, as shown in § 21, though the commentators recognized the omission

¹ See Professor Jolly's Introduction, p xxxii, in *Sacred Books of the East*, vol vii It would be interesting to examine (what I have not been able to do) all early quotations of the list from the Institutes If no quotation earlier than Nanda Pandita can be found, the introduction of the list into the Institutes may be due to that commentator who adopts all the views of Vijnāneśvara

² With regard to the repetition of the forearms, it may be noted that it only occurs in two MSS, viz Nos 12 and 17 In the critical footnotes in the *Bibliotheca Indica* edition, p 197, the reading in question, which occurs in No 12 (Professor Jolly's MS V), is not recorded

of the aims, they were unwilling to meddle with the time-honoured text, and accordingly had recourse to shifts of interpretation. The fact that there was no reluctance to meddle with the text of the Institutes of Vishnu, would seem to show that in that work the list enjoyed no right of inviolability, but was known to be of recent introduction.

4 It only remains to note two lesser points of difference and of agreement between the Institutes of Vishnu and the Law-book of Yājñavalkya. The two points of difference are the following:

(a) In No 1 the Institutes substitutes the curious term *sūkṣma*, or minute (*sci* bone), for *sthāla*, to denote the sockets of the teeth.

(b) It places No 27, breast-bones (*vas*), not at the very end of the list, but between No 24, ribs, and No 25, temples—a location which is no less incongruous (see § 17).

The two points of agreement are the following:

(a) In No 23 *b* the Institutes of Vishnu also uses the curious term *ghanāsthikā*, or *ghana*-bone, to denote the nose.

(b) It also places the phalanges (No 5) after the long bones (No 3), whereas in the Medical Version of Charaka and Bheda the phalanges occupy their natural and logical position in advance of the long bones (§§ 4, 12).

§ 23 *The Non-medical Version in the 'Anatomy'*

1 It remains to notice a work which also contains a version of Atreya's system of the skeleton. Into the preceding discussion it has not been introduced, because its author and age are at present unknown. Nevertheless its testimony¹ on some of the points which have been discussed is sufficiently striking to deserve to be taken into consideration. Its name is simply *Śāṅgīra*, or 'Anatomy', and so far as I know, it is not otherwise known. It is contained in the same MS volume No M a I 483 (Cat No 167) of the Tübingen University Library which contains also the 'Chapter on Anatomy' of the Vishnu Dharmottara Purāṇa, already mentioned in § 14.² Its

¹ This curiously corroborative testimony was discovered by me only after the preceding paragraphs had been written.

² The MSS of both works are written by the same 'hand' of

versified contents are compiled from many different sources, some of which are quoted by name¹ Its statement on the skeleton, in particular, is taken from the Law-book of Yājñavalkya, and accordingly gives the Non-medical Version Though in this case the source is not named, there can be no hesitation as to its identity, seeing that in most of the verses there is a literal agreement (see § 87) But the interesting point is that the agreement fails mainly in verse 87, where, as shown in § 21, the great defect of the Non-medical Version comes in. This verse is entirely rewritten in the 'Anatomy', so as to admit the insertion of the two arms and four wrist-bones

2 The statement on the skeleton in the 'Anatomy' runs as follows (Original Text and literal translation in § 87)

'The body has six parts (*anga*), and of bones it has three hundred and sixty, namely,

- | | | |
|------------|----|---|
| [Verse 85] | 1 | 64 teeth (<i>danta</i>) with their sockets (<i>ulūka</i>) |
| | 2 | 20 nails (<i>nakha</i>) |
| | 3 | 20 long bones (<i>śalākā</i>) |
| | 4 | 4 bases (<i>sthāna</i>) of the long bones |
| [Verse 86] | 5. | 60 phalanges (<i>angulī</i>) |
| | 6 | 2 heels (<i>pārsni</i>) |
| | 7 | 4 ankle-bones (<i>gulpha</i>) |
| | 8 | 4 bones of the forearms (<i>aratni</i>) |
| | 9 | 4 bones of the legs (<i>jangha</i>) |
| [Verse 87] | 10 | 2 collar-bones (<i>amsa</i>) |
| | 11 | 2 shoulder-blades (<i>amsa-phalaka</i>) |

a Bengali writer, and their leaves are numbered consecutively on the left-hand reverse margin It was probably for this reason that in the Catalogue they are described as being a single work called *Viśnu-dharmottara* But that they are really two separate works is proved by the following facts (1) There is an alternative numbering of the folios on their right-hand reverse margins, which is separate for either of the two works, (2) The end of the first work is indicated on the obverse of the fifth folio (or the eighth of the total consecutive count) by the colophon *iti Viśnudharmottar-oktam Sārīram samāptam*, i e here ends the 'Anatomy' declared in the *Viśnudharmottara*, while the end of the second work is on the obverse of the thirteenth folio (twentieth of the total) as *iti Sārīram samāptam*, i e here ends the 'Anatomy', (3) The subject of the two works is identical, and to a large extent they go over the same ground, witness, e g the occurrence of the list of bones in both works

¹ e g Charaka, *Yoga-mulāvatī*, *Kaulāvalī Nirṇaya*, *Lauha-pradīpa*

	12	4	wrist-bones (<i>hasta-mamka</i>)
	13	2	hollow bones (<i>nalaka</i>) of the arms (<i>bāhu</i>)
	14	2	hollow bones (<i>nalaka</i>) of the thighs (<i>ūru</i>)
	15	2	palates (<i>tālu</i>)
	16	2	eyes (<i>netra</i>)
	17	2	knee-caps (<i>gānu</i>)
	18	2	elbow-pans (<i>gānu-kapāhka</i>)
	19	2	hip-blades (<i>śroni-phalaka</i>)
	20	2	basal tie-bones of the (lower) jaw (<i>hanu-mūla bandhana</i>)
[Verse 88]	21	1	pubic bone (<i>bhaga</i>)
	22	45	back-bones (<i>prsthā</i>).
	23	10	neck-bones (<i>grīvā</i>)
	24	1	windpipe (<i>gatrū</i>)
	25	1	(lower) jaw (<i>hanu</i>), or chin
[Verse 89]	26	1	facial bone constituting nose, cheeks, and brows (<i>nāsa-gandakūta-lalātaka mukhe</i>)
	27	72	11bs (<i>pāśvaḥ</i>) with their sockets (<i>kanṭhaka</i>) and tubercles (<i>arbudā</i>)
[Verse 90]	28	2	temporal bones (<i>śankhaka</i>)
	29	4	cranial pan-shaped bones (<i>śiṣṭa-kapāla</i>)
	30	17	breast-bones (<i>śiṣṭa</i>)

These make up the skeleton of man'

3 Comparing the foregoing statement with what has been explained in §§ 17 and 21 regarding the construction of the Non-medical Version in the Law-book of Yājñavalkya, the following points may be observed

(a) The author of the 'Anatomy' noticed the omission of the arms and wrist-bones, and the consequent padding of verse 87 with otiose elements. Hence he entirely rewrote that verse, eliminating all padding, and thus making room for the inclusion of the four wrist-bones (No 12) and two arms (No 13).

(b) He further noticed the difference in the way of counting the facial bones, viz that Charaka counted a single bone for the complex of nose, cheeks, and brows, while the Non-medical Version counted four bones, one for each of the four items nose, cheeks, brows, and eyes. Accordingly¹ he restored Charaka's count (No 26), which process involved the exclusion of the eyes.

(c) On the other hand, probably accepting the authority of the system of Suśruta as against that of Charaka, he retained

¹ Probably on the authority of Chakrapāṇidatta's Commentary (§ 11)

the eyes, but assigned to them a special place in No 16, in the reconstructed verse 87

(d) For the same reason, he appears also to have retained the count of seventeen breast-bones (No 30)

The result of all this manipulation of the statements of the Non-medical Version was that there were now five bones in excess of the required total 360 Hence

(e) He reduced the number of neck-bones by five, counting ten (No 23) against Charaka's fifteen (No 23 in § 4)

4 The whole operation, as above explained, may be exhibited thus

Grand total of the Non-medical Version	360
Add, Two arms (No 13)	2
Four wrist-bones (No 12)	4
Two eyes (No 16)	2
	— 8
Total	368
Deduct, Three facial bones (No 26)	3
Five neck-bones (No 23)	5
	— 8
Balance	360

The objection to this operation is twofold First, the inclusion of the two eyes is not warranted by the Medical Version of either Charaka or Bheda The eyes, in fact, form no item of the skeletal structure in the system of Ātreya, but belong to the system of Suśruta (§ 30) Secondly, the reduction in the number of neck-bones is not warranted by any true view of the skeletal system The correct procedure for the author of the 'Anatomy' would have been to restore Charaka's count of the breast-bones, that is, to count fourteen breast-bones (No 24 in § 4) instead of seventeen This reduction of three bones in the breast, together with the exclusion of the two eyes, would have given him the five bones which he required to redress the excess resulting from his operation

5 On the other hand a distinct improvement made by the author of the 'Anatomy' is his correction of the two ancient false readings *kapola* and *ūru-phalaka* (Nos 11 and 12 in § 16,

and see § 21, cl 3), for which he substitutes the true readings *ū u-nalaka* and *kapālikā*

§ 24 *Relation of the Medical Version to the Non-medical*

1 We are now in possession of all the evidence to enable us to sum up the case concerning the relation of the two Medical Versions (§§ 4, 12) to the Non-medical

2 When the needful corrections are made in the Non-medical Version, which have been indicated in §§ 17-23, that is, when the omitted six bones of the arms and wrists are inserted, and on the other hand, the alterations, made for the purpose of correcting those omissions, are cancelled, the Non-medical Version reveals itself in all essentials to be exactly the same as the Medical Version of Charaka in the restored form given in § 7

3 But in two striking points of terminology, the Non-medical Version differs from the Medical Version, whether of Charaka or of Bheda. These are first, the use of the term *sthāla* (No 1 in § 16) or *sūkṣma* (§ 22, cl 4a) to signify the sockets of the teeth, where the two Medical Versions have the term *ulūkhala*. Secondly, its use of the term *ghanāsthikā* to denote the nose, which is not found in the two Medical Versions. The latter term has been a puzzle to all commentators. They simply refer to it as 'the so-called *ghana* bone' (*ghana-samyñamasthi*), but do not attempt to explain it. But seeing that there exists a Sanskrit word *ghrāṇa*, or Prākṛit *ghāṇa*, meaning 'smelling' or 'nose', it may be suggested that *ghanāsthikā* represents the Sanskrit word *ghrāṇ-āsthikā*, lit. smelling bone, which in the ordinary Prākṛit would take the form *ghāṇatthikā*, but in the North-Western Prākṛit, or the well-known Vernacular Sanskrit of those parts, which were the home of the school of Ātīeya, might very well have been *ghanāsthikā*.

4 Also, in a formal point of arrangement, the Non-medical Version differs from the two Medical Versions. In the former the phalanges are placed after the long bones (§ 22, cl 4b). In the Medical Versions of Charaka (§ 4) and Bheda (§ 12), on the other hand, they precede the long bones. The latter arrangement, it is hardly necessary to say, observes the natural and logical order of the bones.

5 These differences, comparatively trifling as they are, seem to warrant the inference that the Non-medical Version is based neither on the Compendium of Charaka (i.e. ultimately of Agniveśa) nor on that of Bheda, but that, as suggested in § 1 (p. 4), it represents a third Medical Version which may have stood in the Compendium of another of the six pupils of Atreya, whose identity at present is unknown.

6 A coincidence may be worth noting. In the existing MS of the *Bheda Samhitā* the clause referring to the aims is missing (§ 13, cl. 1). Exactly the same omission is found in the Non-medical Version (§ 17, cl. 2 c). The author of that version, as has been suggested in § 21 (p. 58), must have had a defective MS of the Medical Version to work with. The actual existence of such defective manuscripts is curiously corroborated by the MS of the *Bheda Samhitā*.

§ 25 General Conclusions

The principal results of the investigation in the preceding paragraphs may now be summarized as follows.

1 In the Medical and Non-medical Versions we possess three independent presentments of the doctrine of Ātreya concerning the skeleton, transmitted, probably, by three members of his school. To two of these members, Agniveśa and Bheda, the two Medical Versions professedly are due. Agniveśa's Version we possess only as contained in the Compendium of Charaka, but that Charaka introduced no material change into it, is proved by its close agreement with the Version of Bheda. The name of the third member, on whose presentment of Ātreya's system the Non-medical Version probably is based, is not known, neither its reputed author Yājñavalkya, nor any of the old commentators recording any tradition on the subject.

2 The text of the statement on the skeleton has not been preserved in a quite perfect condition in any of the three Versions. Several of the corruptions now found in them, e.g. the misplacement of No. 19, palatal cavities (*tālūsaka* in §§ 4, 12, or No. 15 in § 16), are of a very ancient date, going back at least to the fourth century A.D., seeing that they appear in

the Law-book of Yājñavalkya which belongs to that century (§ 14). Fortunately (as may be seen by comparing § 4 with § 7), with the exception of one, none of these corruptions is of any great importance. Being clerical errors of misplacement or duplication they merely affect the external form of the statement. The single exception which affects the substance of the statement is the error concerning the number of the wrist-bones (*manika*), which is said to be two instead of four (No 9 in §§ 4, 12). That there existed in the medical manuscripts, in this particular place, a more or less serious corruption of the text from a very early date, is shown by the fact that in the fourth century A D Yājñavalkya, in preparing his Law-book, apparently was unable to make anything of the medical text which was available to him, and thus came to omit from his Non-medical Version all mention of the wrist-bones. Nevertheless, as will be shown in § 52, with a little attention to the actual structure of the skeleton, it is easy enough to detect and remedy the error. As has been shown in § 23 (p 63), the error was detected and corrected by the unknown author of the 'Anatomy', and it is one of the merits of Gangādhara's edition of the Compendium of Charaka, that in his otherwise much misconceived reconstruction of Charaka's Medical Version (§ 8), he made the number of the wrist-bones to be four¹.

NOTE — It may be useful briefly to put together the various indications which go to prove that, in the osteological summary of Charaka, the true number of the wrist-bones was not two but four.

(1) As shown in paragraph 6, the exclusion of the two *amsa* as an otiose repetition necessitates a corresponding increase in the number of wrist-bones.

(2) As shown in § 52, the system of Charaka, consistently construed, requires the count of four wrist-bones.

(3) As shown in § 17, that count is a necessary factor of a correct appreciation of the confusion in the Non-medical Version.

(4) As shown in §§ 19 and 23, both Gangādhara and the anonymous author of the 'Anatomy', in their attempted reconstructions,

¹ Possibly Gangādhara may have been acquainted with the anonymous 'Anatomy'. See also the remarks in § 78 on Gangādhara's doctrine of four wrist-bones, in his reconstruction of the Non-medical Version.

find it necessary to admit that count, and in fact, without it no intelligent and consistent reconstruction appears to be possible.

Regarding the exclusion of the item *amsa*, as an otiose duplication, it is supported by the following circumstances

- (1) The actual occurrence of the similar duplication of *jānu* (§ 6)
- (2) The actual omission, in the Non-medical Version, of both reduplicated words *amsa* and *jānu* (§§ 16, 17)
- (3) The exclusion of *amsa* in the attempted reconstruction of Gangādhara (§ 9, p 30)
- (4) The mention of only two bones in the shoulder, in the osteological system of the Atharva Veda (§ 43, cl 6)

B THE SYSTEM OF SUŚRUTA

§ 26. *Suśruta's Statement and its Recensions*

1 Suśruta's system of the bones of the human body is stated in the beginning of the fifth chapter of the third or Anatomical Section (*Śārīra Sthāna*) of his Compendium.

2 There exist two recensions of this statement. One is printed in Jivānanda's edition of the Compendium, p 331, paragraphs 15 and 16 (Calcutta, 1889), as well as in all other editions with which I am acquainted, e g in the editions of Madhusūdana Gupta, p 339 (Calcutta, 1834), of Piabhuram Jivānāram, p 481, paragraphs 18-21 (Bombay, 1901), Vīrasvāmī (Madras). The other occurs in Gangādhara's Commentary (called *Jalpa-kalpātara*) on the Compendium of Charaka, p 188, lines 5-14 (Benhampton, 1879, see § 3). These two recensions differ so widely from each other that it becomes necessary once again to inquire into their respective authorization.

3 The recension which is found in Jivānanda's and all other prints, and which, in the sequel, will be referred to as the Traditional Recension, has in its favour not only all available manuscripts, but also all ancient commentaries on the Compendium of Suśruta, as well as all such older medical works as adopt Suśruta's system of the skeleton. Or shortly, the Traditional Recension is supported by the whole body of existing witnesses.

4 As regards manuscripts, I have been able to examine the

following eleven copies, in all of which the existence of the Traditional Recension has been verified

1. The Alwar Palace Library MS, No 1703¹
2. The Benares College MS, No 23 (old No 64), fols 18, 19¹
3. The Deccan College MS, No 406, of 1895-8, fols 37 *b*, 38, dated Samvat 1704 = A D 1647
4. The Deccan College MS, No 948, of 1884-7, fol 14, undated.
5. The Deccan College MS, No 949, of 1884-7, fols 53 *b*, 54, 55 *a*, with Dallana's Commentary; undated
6. The Deccan College MS, No 956, of 1891-5, fol 15, undated
7. The Deccan College MS, No 224, of 1882-3, fols 23, 24 *a*, dated Samvat 1640 = A D 1583¹
8. The Bodleian MS (Hultsch), No 349, fol 31, in Śārada characters, on paper, undated, a Kashmir MS
9. The Bodleian MS, No 739 (Wilson 290), fol 19
10. The India Office MS, No 72 *b* (Cat No 2645), fol 17, dated Samvat 1696 = A D 1639, contains only the *Śārīra Sthāna*
11. The India Office MS, No 1842 (Cat No 2646), fols 21 *b*, 22 *a*, undated, contains Chandrata's revision of the text, based on the Commentary of Jayyata

It should be observed that these MSS come from widely separated Indian localities, and that three of them, Nos 3, 7, 10, are of a considerable age—facts which enhance the value of their testimony as that of independent witnesses

5 As to old commentaries, we have the two works, compiled by Gayadāsa and Dallana (§ 2) Of the former, I have been able to consult the unique MS preserved in the Cambridge University Library, Add 2491, fols 48 *b*, 49 *a*, of the latter, the Deccan College MS, No 949, of 1884-7, fols 53 *b*, 54, 55 *a* (see above, No 4) Of the latter, there is also the edition published by Jivānanda, Calcutta, 1891 Both commentaries are based on the Traditional Recension, and contain not the remotest indication of being acquainted with the recension printed by Gangādhar A number of other old commentaries are known by name, for

¹ A copy of the statement on the skeleton from MS No 1 was most kindly supplied to me by Major P T A Spence, British Political Agent, from No 2, by the Principal of the Benares College, and from Nos 3-7, by Professor K B Pathak, of the Deccan College

which Dr Coidier's *Récentes Découvertes*, pp 13, 14, may be consulted But no copies of any of them—so far, at least, as the Anatomical Section (*Śārīra Sthāna*) is concerned—have as yet come to light

6 As to older medical works which explicitly adopt Suśruta's system of the skeleton, we have the following two (§ 2)

(1) The *Śārīra Padmīnī*, by Bhāskara Bhatta (c A D 1000), a manuscript of which is in the possession of Dr P Coidier (*Récentes Découvertes*, p 30), dated Samvat 1735 = A D 1678, and from which a copy of the statement on the skeleton was very kindly supplied to me by the owner

(2) The *Bhāva Prākāśa*, by Bhāva Miśra, in the sixteenth century, edited by Jīvananda, and others.

Both works contain independently versified versions of the prose statement of Suśruta, made by the authors themselves, but based on the Traditional Recension of that statement

7. As regards Gangādhara's recension, I have not been able to discover for it any authority whatsoever It will be shown in the sequel (§§ 29–33) that the Traditional Recension is obnoxious to several very serious difficulties, and it is probable that the recension of Gangādhara (§ 35) is a reconstruction of his own to meet those of the difficulties which he had noticed Though in some respects, his reconstruction is an improvement on the Traditional Recension, it cannot be accepted as satisfactory, because it fails to meet the most serious of the difficulties of that recension

§ 27 The Traditional Recension of Suśruta

1 The Traditional Recension of Suśruta's statement (Original Text in § 88) on the human skeleton runs as follows

'The professors of General Medicine (*āyurveda*) speak of three hundred and sixty bones¹ But books on surgical science (*śalya-tantra*) know only of three hundred Of these there are one hundred and twenty in the extremities, one hundred and seventeen in the pelvic cavity, sides, back, abdomen (*udāra*), and breast, and from the neck upwards there are sixty-three In this wise the total of three hundred bones is made up Now in each toe of the foot, there are three bones, this makes altogether

¹ The reference here is to the doctrine of Ātreya and his school, preserved for us in the Compendia of Charaka and Bheda (§§ 4, 12)

fifteen Those bones which constitute the sole, cluster, and ankle are ten In the heel there is one, in the leg there are two, in the knee there is one, so also in the thigh Thus there are thirty bones in one lower limb The same count applies to the other lower limb, as well as to the two upper limbs In the pelvic cavity there are five bones. Of these there are four in the anus, pubes, and hips, and the fifth constitutes the triangular (*triḥa*) sacrum There are thirty-six bones in one side, and as many in the other In the back there are thirty, eight in the breast, two in what are called the collar-bones (*akṣaḥa-samjñā*), nine in the neck, four in the windpipe, and two in the jaws The teeth number thirty-two In the nose there are three bones There is one in the palate, also one each in either cheek, ear, and temple, and there are six in the cranium'

2. This detailed enumeration works out a total of 300 bones, as shown in the subjoined table

I FOUR EXTREMITIES		
1	Phalanges (<i>angulī</i>)	15 × 4 = 60
2	Soles (<i>tala</i>) ¹	} 10 × 4 = 40
3	Clusters (<i>kūrcā</i>) ¹	
4	Ankle-bones (<i>gūlpha</i>)	
5	Heels (<i>pārsni</i>)	1 × 4 = 4
6	Legs (<i>jaṅgha</i>)	2 × 4 = 8
7	Knees (<i>jānu</i>)	1 × 4 = 4
8	Thighs (<i>ūru</i>)	1 × 4 = 4 — 120
II TRUNK		
9	Pelvic cavity (<i>śronī</i>)	5
10	Sides (<i>pārsva</i>)	36 × 2 = 72
11	Back (<i>prsthā</i>)	30
12	Breast (<i>uras</i>)	8
13	Collar-bones (<i>akṣaḥa</i>)	2 — 117
III NECK AND HEAD		
14	Neck (<i>grīvā</i>)	9
15	Windpipe (<i>kantha-nādī</i>) ¹	4
16	Jaws (<i>hanu</i>)	2
17	Teeth (<i>dantā</i>)	32
18	Nose (<i>nāsā</i>)	3
19	Palate (<i>tālū</i>)	1
20	Cheeks (<i>gandā</i>)	2
21	Ears (<i>karṇa</i>)	2
22	Temples (<i>śankha</i>)	2
23	Cranium (<i>śiras</i>)	6 — 63
Grand total		300

¹ *Tala*, *kūrcā*, and *kantha-nādī* are identical with Charaka's *śalālā*, *sthāna*, and *jatru* (§ 4) respectively

§ 28. *Suśruta's List compared with Charaka's*

Comparing Suśruta's list of bones with that of Charaka the following five points present themselves:

1. The Principle of Position Suśruta divides the body into three parts, and explicitly enumerates the bones in accordance with their position in those divisions. Charaka (as representing Ātreya) also refers to this principle, but does not explicitly apply it to his enumeration. In fact, if the Traditional Recension (§ 4) is correct, he does not strictly adhere to it (§ 5).

2. The Principle of Homology The osteological system of Suśruta is strictly based on the principle of homology, according to which the several organs of the right and left, and of the upper and lower halves of the body, correspond to each other. This comes out clearly in the Table in § 27, where the bones of the four extremities are succinctly enumerated on that principle. On the other hand, Ātreya-Charaka does not appear to have fully realized the homologies of the skeleton. The order in which he enumerates the bones of the four extremities (Nos 8-15 in § 14), no doubt, indicates some degree of recognition of the principle of homology, and the manner in which he arrives at his total number of the vertebral column is intelligible only on the implication of the same principle (§§ 59, 61). But in the latter case, it is not applied by him with the thoroughness of Suśruta, and it fails him entirely with respect to the cranial and facial bones, which are treated by Suśruta alone on the homological principle (§§ 63, 66). The clearness with which that principle was recognized by Suśruta is shown by the subjoined statement (Original Text in § 96, cl 1) in the sixth chapter of his Anatomical Section, which is devoted to an enumeration of the so-called 'vital spots' (*marman*) in the body:

'In particular, just as there are in the leg (or lower limb) the three mortal spots—ankle, knee, and ischio-pubic arch,¹ so there are in the arm (or upper limb) the three mortal spots—wrist, elbow (*kūpara*), and collar-bone. Just as between the hip-bone and the scrotum there is the ischio-pubic arch, so between the breast-bone and the armpit there is the clavicular arch.'

¹ The *vitapa*, or ischio-pubic arch, is formed by the combined rami of the os pubis and the ischium. See Figs 4 and 20.

On the other hand (see §§ 41, 47) Suśruta carries his principle of homology to undue lengths in postulating three joints in each of the phalanges, and (at least, according to the Traditional Recension¹) the existence of heels in the hand.

3 Alteration of Terms The list of Suśruta introduces three new terms. These are No 2, *tala*, No 3, *kūrca*, and No 15, *lantha-nādī*, which take the place, respectively, of Charaka's terms *śalākā*, *sthāna*, and *gatu*. The identity of the organs indicated by these alternative terms will be discussed in the Third Section (§§ 48, 49, 62). A fourth new term, which does not occur in the list, but is mentioned in the passage just quoted, is *kūrpāra*, which is an alternative for Charaka's *kapā-lākā*, elbow-pan (No. 13 in § 4), and for the false term *kapola* of the Non-medical Version (No 11 in § 16, see § 19, p 52).

4 Alteration of Items Suśruta omits from his list the thirty-two sockets of the teeth which occur in the list of Charaka (No 2 in § 4). On the other hand, he introduces the two ears (*larna*), and (as may be mentioned here in anticipation of § 30) also the two eyes (*akṣi*). The omission of the sockets is due to Suśruta's counting two jaws in the place of Charaka's one (lower) jaw (No 26 in § 4). The insertion of the ears and eyes is due to Suśruta's counting cartilaginous structures among the bones of the body (§ 30). The whole subject, however, of these alterations, as well as of others affecting the numbers of the bones in each item, will be discussed in full detail in the Third Section.

5. Alteration respecting Structure With regard to two points Suśruta's views of the skeleton differ very considerably from those of Ātreya-Charaka. These are the structure of the vertebral column and of the skeletal face. On both points, as

¹ On this point, however, the Traditional Recension is wrong, see § 32.—A neat statement of the homologies of the four extremities occurs in Aṣṭadatta's Commentary to the *Aṣṭāṅga Hṛdaya*, *Sūtrā Sthāna*, ch 3, verses 14, 15 b (vol II, p 549 in the first edition) 'the bones of the two upper limbs are homologous to those of the two lower limbs. They may be detailed as follows. The hand corresponds to the foot, the base of the hand to the heel, and the wrist to the ankle. The cluster exists alike in both. The forearm corresponds to the leg, the elbow to the knee, and the arm to the thigh.'

will be fully explained in §§ 59, and 65, 66, the system of Suśruta marks a distinct advance in anatomical knowledge

§ 29. *Difficulties and Inconsistencies of the Traditional Recension*

1 The Traditional Recension of the statement of Suśruta is beset with many difficulties and inconsistencies, both in respect of form and matter, which render it impossible to accept it as the genuine production of Suśruta

2. As regards the form, there are two points which deserve consideration. In the first place, with reference to the bones of the trunk, the Traditional Recension states that they are distributed over 'the pelvic cavity, sides, back, abdomen, and breast' (§ 27) That this is the true reading of the Traditional Recension is proved by the fact that the two medical works, *Śārīra Padmīnī* and *Bhāva Prakāśa*, which adopt the statement of Suśruta, giving it, however, in a versified form of their own (§§ 26, 36), also name the abdomen (*udara*) in this connexion. The mention of the abdomen as a seat of bones may well cause surprise, and a suspicion that there must be some error in the text The suspicion is confirmed when we find that in the subsequent enumeration of the bones in their several seats, the collar-bones (*aḥśaka*) take the place of the abdomen (*udara*) As the collar-bones form a part of the shoulder-girdle, it suggests itself that the Sanskrit text of the statement of Suśruta, in its original and genuine form, must have read *amsa*, shoulder, instead of *udara*, abdomen A very probable explanation of the origin of the error in the Traditional Recension may be given In the classification of the bones according to their shape (§ 30), the text of the Traditional Recension has the compound word *msth-udara* (i e *msthā*, back, and *udara*, abdomen) In this connexion the introduction of the term *udara*, abdomen, has a good reason It is to indicate the position of the pubic arch (§ 60, cl 2) as located in the anterior (or ventral) part of the pelvis The latter organ comprises five bones (§ 27), viz the two hip-blades (*utamba*), the sacrum (*triṣa*), the coccyx (*guda*), and the pubic arch (*bhaga*) These five bones belong to two different classes: the hip-blades and the sacrum (incl coccyx) belong to

the pan-shaped (*lapāla*), while the pubic arch belongs to the ornament-like (*valaya*). Hence, in classifying them according to their shape, the term *śroni*, pelvis, indicative of their common locality, could not be used, but each bone had to be indicated by its peculiar locality. Hence the sacrum and coccyx are indicated by the back (*psthā*), and the pubic arch by the ventral part (*udara*) of the pelvis. The compiler of the Traditional Recension, failing to understand this, introduced the term *psth-udara* also into the enumeration of the bones according to their position in the body. But here the term is quite out of place. For the common locality of the five bones is already defined by the term *śroni*, pelvic cavity, while the locality of the bones of the shoulder-girdle (*amsa*) is entirely ignored. It can, therefore, hardly be doubted that the reading *psth-udara*, back and abdomen, of the Traditional Recension is an erroneous substitute for the true reading *psth-āmsa*, back and shoulder.

3 In the second place, it will be shown in the next paragraph that the Traditional Recension omits all mention of the two shoulder-blades. These have their seat in the shoulder-girdle along with the collar-bones. One expects, therefore, in the enumeration of the 117 bones of the trunk, to find them mentioned in the clause respecting the collar-bones. As a fact, however, the Traditional Recension, while mentioning the two collar-bones, omits the shoulder-blades altogether. But it is noteworthy that the clause in question is worded in a very peculiar way. The Recension says 'two in what is called the collar-bone' (*dvē aksaka-samyñe*)¹. The expression 'what is called' (*samyñā*) is not employed in connexion with any other part, or bone, of the body. Yet there is nothing in the name *aksaka*, for collar-bone, that calls for the use of the phrase *samyñā*, 'what is called'. It suggests itself that that word *samyñā* is a false reading, and that in all probability a word expressive of the missing shoulder-blades originally stood in its place. The ordinary term for shoulder-blade is *amsa-phalaka*, but the shorter word *amsa-ja*, literally 'shoulder-born', or

¹ *Samyñe* is here taken as the locative singular. It might also be taken as the nominative dual, 'two so-called collar-bones'. The argument is not affected thereby.

'issuing from the shoulder', would not be inappropriate, and might also be used. It is significant that the Non-medical Version of the system of Ātīya employs a synonym of the latter word, *amsa-samudbhava*, 'issuing from the shoulder,' to denote the shoulder-blade (see No 13 in § 16). It will be shown in § 33, with respect to another point, that the Non-medical Version betrays marks of having been influenced by the system of Suśruta, and it suggests itself that the author of that Version was led to the choice of the term *amsa-samudbhava* by the occurrence of the synonymous term *amsa-ja* in the statement of Suśruta. It may be suggested, therefore, that, in the latter statement, in its original form in which we may suppose it to have left the hand of Suśruta, the clause respecting the collar-bones probably ran (not *dve aksaka-samyñe*, but) *dve aksak-āmsaje*, 'two in the collar-bones and shoulder-blades'¹, and that the word *amsaje* became corrupted into *samyñe*.

§ 30 Continuation

1 In respect of the matter of the statement, the Traditional Recension labours under three great difficulties

In the first place, the list is incomplete. It omits two of the most conspicuous bones of the skeleton, namely, the shoulder-blades (*amsa-phalaka*, No 16 of Charaka's list in § 4). It also omits the two eyeballs (*akṣi-kṣa*). In omitting these two items Suśruta's list, as it stands in the Traditional Recension, is inconsistent with another statement of his. Immediately following the list of bones in which Suśruta enumerates them according to their position in the body, he continues with another list dividing the bones into five classes according to their shape. This class-list (Original Text in §§ 88, 89) runs as follows

'These bones are of five kinds, namely, pans (*lapāla*), sharp-ones (*śucaḥa*), tender-ones (*taruna*), ornaments (*valaya*), and reeds (*nalaka*). From among them the pan-shaped bones occur in the knees, elbows, hips, shoulders (*amsa*), cheeks, palate, temples, interiliac space (i.e. sacrum), and cranium. The sharp

¹ Or alternatively, 'two collar-bones and two shoulder-blades'

bones are the teeth. The tender bones occur in the nose, ears, neck¹, and eyeballs (*akṣi-kosa*). The ornament-shaped bones occur in the hands, feet, sides, back, abdomen, and breast. The remainder of the bones are termed reed-shaped².

2. A comparison of the two lists, as given in the subjoined table, shows that all the items of the number-list reappear in the class-list with the exception of two which the latter contains in excess

<i>Number-list</i> (as in § 27)	<i>Class-list</i>	<i>Class-name</i>
1 Phalanges	ditto	reed
2 Soles	ditto	reed
3 Clusters	ditto	ornament
4 Ankle-bones, wrist-bones	ditto	ornament
5 Heels	ditto	ornament
6 Legs, forearms	ditto	reed
7 Knees, elbows	ditto	pan
8 Thighs, arms	ditto	reed
9 a Hip-blades, anal, sacral	ditto	pan
9 b Pubic arch	ditto	ornament
10 Sides (i.e. ribs)	ditto	ornament
11 Back-bones	ditto	ornament
12 Breast-bones	ditto	ornament
13 Collar-bones	ditto	reed
14, 15 Neck, windpipe ²	ditto	tender
16 Jaws	ditto	reed
17 Teeth	ditto	sharp
18 Nose	ditto	tender
19 Palate	ditto	pan
20 Cheeks	ditto	pan
21 Ears	ditto	tender
22 Temples	ditto	pan
23 Skull-bones	ditto	pan
24 —	Shoulder-blades	pan
25. —	Eyeballs	tender

3 Seeing that the class-list is intended to distribute all the items of the number-list into five kinds, it is evident that

¹ The reference, of course, is to the *jatru* or *lanthanādī*, the windpipe in the neck, see § 62, cl 3

² See the preceding note. The neck contains two organs, the neck-bones or cervical column, and the windpipe. In the class-list, of course, the latter is intended. The former, being a portion of the vertebral column, counts with No 11, and belongs to the ornament-shaped class. The use of the term *grīvā* here is rather inaccurate, as it is usually employed to denote the cervical column.

the number-list, in the form in which it is found in the Traditional Recension, cannot be correct, but that, in its original and genuine form, it must have contained those two additional items No 24, shoulder-blades, and No 25, eyeballs. It is true that, with reference to No 24 in the class-list, the Traditional Recension employs the term *amsa*, which, in the Compendium of Suśruta, ordinarily denotes the collar-bone, but from the context it is quite obvious that, in the present case, it can refer only to the shoulder-blades. For the bones, here called *amsa*, are classed as pan-shaped (*lapāla*)—a description which is applicable only to the shoulder-blades. The collar-bones could only be described as reed-shaped (*nalaka*) and these bones, therefore, must be taken as referred to in the last class or the 'remainder' of the list. In literary Sanskrit the word *amsa* denotes, in a general way, the shoulder, in medical Sanskrit, at least of the Compendium of Suśruta, the several parts of the shoulder have specialized names: *amsa* is the collar-bone, *amsa-phalaka* (or *amsa-ja*), the shoulder-blade, *amsa-kūta*, the acromion process, and *amsa-pītha*, the glenoid cavity. The author of the Traditional Recension would seem to have been a person, who was imperfectly familiar with the anatomical terminology of Suśruta, and used the term *amsa* in the undefined literary sense, or more probably it is a scribal error for *amsa-ja* or *amsa-phalaka*. For a fuller discussion, see §§ 55, 56.

4 As regards the eyeballs, the class-list explicitly enumerates them among the 'tender' bones. In agreement herewith, speaking of the structure of the eye in the Supplementary Section (*Uttara Tantra*) of his Compendium, Suśruta describes the sclerotic coat of the eyeball as made of bone (*asthi*). The statement in question, describing the eye as seen in the sagittal section (Fig 1), runs as follows:

'The outer one of the protecting covers¹ of the pupil consists of a luminous fluid, and the next one of flesh. The third is

¹ *Patala* denotes the protecting covers of the *drsti*, or pupil, the supposed seat of vision. The composite nature (the 'tunics', incl retina, choroid) of the 4th cover does not seem to have been known to the early Indian anatomists, nor the lens, which they thought to be a morbid accumulation of phlegm.

made of fat, and beyond it there is one consisting of bone' (Original Text in § 96, cl. 2)

It may be noticed also as a significant fact that the Non-medical Version of the system of Ātīeya (§ 16) includes the eye-balls in the list of bones of the human body. The genuine list of Ātīeya, as handed down by Charaka (§ 4) and Bheda (§ 12), does not count the eyes among the bones. The author of the Non-medical Version of that list, therefore, must have obtained the eyes from some other source, and this source cannot well have been any other than Suśruta's statement on the skeleton. If so, it follows that the latter statement, at the time of the

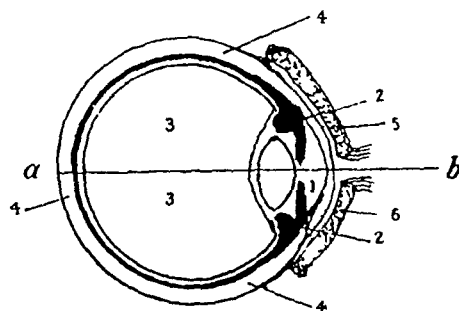


FIG 1 DIAGRAM OF THE EYE, in Sagittal Section
a-b Optic Axis

- 1 Outer cover, *Bāhya patala*, of luminous fluid, *Tejo-pala* (Aqueous humour)
- 2 Cover of muscle, *Pīṣṭa patala* (Ciliary body)
- 3 Cover of fat, *Medas patala* (Vitreous humour)
- 4 Cover of bone, *Asthī patala* (Sclerótica)
- 5, 6 Covers of eyelids and eyelashes, *Pakṣma-varṭma patala*

composition of the existing Law-book of Yājñavalkya, must have differed from the now existing Traditional Recension, and must have included the eyes in its list of bones

5 It is clear, then, that Suśruta's list of bones of the human body, in its genuine form, must have contained four additional bones, viz two shoulder-blades and two eyeballs. As regards the shoulder-blades, it has been shown in the preceding paragraph that their omission, in all probability, is due to a misreading of the term *samyāna* for *amsaja*. As to the eyes, they

would appear simply to have dropped out of the penultimate clause (§ 27) which should run 'one each in either cheek, eye, ear, and temple'

NOTE—With regard to the terms which occur in the class-list, *nalaka* means a reed, but not necessarily a hollow reed, it may be solid like the male bamboo. As used by the Indian anatomists it denotes any long bone, whether tubular or solid. Suśruta does not specify the bones which he likens to a *nalaka* or reed, but only says that they are 'the remainder', that is, that they are all those bones which do not fall into any of the other four classes. The process of exhaustion thus indicated shows that he classed as 'reed-like' bones the following—the phalanges, the metacarpals and metatarsals, the bones of the forearms, legs, arms, and thighs, the collar-bones and the jaw-bones. The commentators Dallana (ed Jiv, p 576) and Gayadāsa (Cambridge MS., Add 2491, fol 49 a, line 3), following a doctrine of Bhoja (Original Text in § 96, cl 3), include the clusters, ankle-bones and wrist-bones among the 'reed-like' bones. But seeing that these particular bones have not the smallest resemblance to reeds, their inclusion only proves the total want of experimental knowledge of them on the part of Bhoja and the commentators.

Valaya is the name of a certain kind of personal ornament, such as bracelets, anklets, necklets, waist-bands, &c. They are well seen on the figures of the Bharhut Stūpa (of about the 2nd century A D), called Chulakokā and Suchiloma, shown in Figs 2 and 3¹. Suśruta states that these *valaya* bones are found in the hands and feet, and in the sides, back, abdomen, and breast. Those in the hands and feet are the clusters (carpus and tarsus), wrist-bones (styloid processes), ankle-bones (malleoli) and heels. They resemble bracelets and anklets. The latter are shown in Fig 2. The other bones indicated by him are the ribs, the bones of the vertebral column, also the costal cartilages and sternum, all of which resemble a necklace (Fig 2), and the pubic arch which resembles the bow of a waist-band (Fig 3).

By the term *taruna*, tender bones, cartilages are denoted

¹ Reproduced from Sir A Cunningham's Report. See also Professor Hultzsck, in the *Journal of the German Oriental Society*, vol xl, p 63, No 26.

FIG 2



GODDESS CHULAKOKA

FIG 3



YAKSHI
MAN SINGH MEDIC
CHILOMA

(From the Stupa of Bharhut)

The statement of Di Wise (*Hindu System of Medicine*, p 52) that 'the difference [between Suśruta's total 300 and Charaka's total 360] is owing to their counting the cartilages with the bones' is hardly correct. Both writers include cartilages in their counts, though in different ways. The difference in their totals is mainly due to Charaka's counting the thirty-two sockets of the teeth as separate bones, and his including the twenty nails, neither of which are admitted in the count of Suśruta. See § 38, col IV in the Table (p 93)

§ 31 Continuation

1 In the second place the number ten, given in the Traditional Recension as the aggregate of the bones of the sole, cluster, and ankle (Nos 2, 3, 4 in § 27), is inconsistent with other explicit statements of Suśruta. His commentator Dallana¹ explains that number ten in the following way

'The term sole (*tala*) refers to the five long bones (*śalākā*) and to the single bone that connects them. The cluster (*kūṇca*) and the ankle (*gūlpha*) contain two bones each. Hence we have ten' (Original Text in § 96, cl 4)

Dallana, therefore, identifies Suśruta's sole (*tala*) with Charaka's long bones (*śalākā*) and base (*sthāna*), that is, with Nos 5 and 6 in § 4. He thus obtains six bones for the sole. Adding to them two cluster-bones and two ankle-bones, he makes up the aggregate ten. It has been pointed out in § 9, cl 1 b, that the terms cluster (*kūṇca*) and base (*sthāna*) are merely two different names, employed by Suśruta and Charaka respectively, for the same portion of the hand and foot, viz the carpus and tarsus. Differentiating them, after the manner of Dallana, argues a want of anatomical knowledge such as cannot be attributed to Suśruta. In fact, as will be shown in § 40, the person responsible for this incongruity is, in all probability, Vāgbhata I. But in any case, it is quite sufficient by itself to discredit the genuineness of the Traditional Recension.

¹ The earlier commentator Gayadāsa also mentions ten as the aggregate, though he does not enter into further details.

2 But further, the aggregate ten conflicts with the explicit statements of Suśruta himself regarding the number of clusters (*kūṇca*) and ankle-bones (*gūḷpha*). On Dallana's theory there would be two clusters and two ankle-bones in either foot, and homologously two clusters and two wrist-bones (*manibandha*) in either hand. This results in an aggregate of eight clusters (*kūṇca*), four ankle-bones (*gūḷpha*) and four wrist-bones (*manibandha*). On the other hand, Suśruta teaches explicitly that there are only four clusters in the hands and feet, two ankle-bones and two wrist-bones. Thus in the fifth chapter of the Anatomical Section (*Śāṛīra Sthāna*) he says

‘There are six clusters (*kūṇca*) in the hands, feet, neck, and penis—namely, two in the hands, two in the feet, and one each in the neck and penis’ (Original Text in § 96, cl 5)

That is to say, there is one cluster in each hand and foot, making four, also one each in the neck and penis, making two, or an aggregate of six.¹ Again in the sixth chapter of the same Section, Suśruta says

‘There are two ankle-bones (*gūḷpha*) and two wrist-bones (*manibandha*)’ (Original Text in § 96, cl 6)

3 It is evident, therefore, that Dallana's explanation of the aggregate ten involves a doctrine which was not held by Suśruta. It is, as will be shown in § 39, in reality the doctrine of Vāgbhata I. An aggregate of ten, in fact, directly conflicts with the explicit doctrine of Suśruta. According to the latter, the sole (*talā*) consists of five long bones (*śalākā*, § 28, cl 3), and

¹ *Kūṇca* simply means a cluster of something, but not necessarily a cluster of true bones. In the case of the hands and feet, it is a cluster of small bones, but in the case of the neck, it refers to the cluster, or series, of imperfect cartilaginous rings which compose the windpipe (trachea), and apparently a similar view was held of the structure of the penis—There are several other passages in the Compendium of Suśruta which confirm his doctrine of there being only four clusters in the hands and feet. They occur in the sixth chapter, on the ‘vital spots’. There Suśruta speaks of 27 such spots in the sinews (*snāyū-marmāni*, Jiv ed, p 337, cl 10) and 44 such spots causing weakness (*vāṅkalya-karāni marmāni*, Jiv ed, p 338, cl 13). These numbers will not work out correctly, unless the clusters included in them are counted as being only four. The peculiar force of these passages lies in the indirectness of their evidence.

there are one cluster (*kūca*) and one ankle-bone (*gūpha*) The true aggregate, therefore, can be no more than seven, and it follows that Suśruta's list of the bones, in its genuine form, must have contained that aggregate, but not ten

§ 32 Continuation

1 In the third place, the number one hundred and twenty, given in the Traditional Recension, as the aggregate of the bones of the four extremities, involves (as may be seen from the Table in § 27) the incongruity of counting four heels That count is based on a misconstruction of the explanatory direction of Suśruta He enumerates the bones of one lower extremity (*śathā*) as amounting to thirty, and proceeds to explain that in the same way the count of the bones in the other lower extremity, as well as in the two upper extremities, must be made Now his aggregate, thirty, of the lower extremity includes the heel bone, but it does not follow, therefore, that the same way of counting, when applied to the upper extremities, must also include a heel bone In short, Suśruta intended his explanation to be understood *cum grano salis* In the case of the lower extremities which contain a heel, the aggregate is thirty, but in the case of the upper extremities which do not contain a heel, the aggregate, of course, must be twenty-nine This means that no more than two heels may be counted, in making up the aggregate of the bones of the four extremities

2 I know of no direct evidence as to the exact number of heels held by Suśruta, such as was available in the case of the two difficulties discussed in §§ 30 and 31 But neither is there any direct evidence for Suśruta's holding four heels, including two for the hands It is also worth noting that the list of Charaka includes only two heels, and there is no reason for imputing to Suśruta a more incongruous view than Charaka held On the whole, therefore, it is only reasonable to believe that the statement of Suśruta, in its genuine form, cannot have been intended to teach the existence of more than two heels

§ 33 *Continuation*

1 The result of the discussion in the preceding paragraphs (§§ 30-2) is the reduction of the total of the bones, as enumerated in the Traditional Recension, from 300 to 290

Thus

Total of Traditional Recension (§ 27)	300
Add 2 shoulder-blades and 2 eyes (§ 30)	4
	<hr/>
Total	304.
Deduct 4 bases, 4 clusters, 2 ankle-bones,	
2 wrist-bones (§ 31)	12
Also deduct 2 heels (§ 32)	2
	<hr/>
	14
	<hr/>
Balance	290

2 This resultant shortage of ten bones, of course, must be compensated in some way. A comparison of the lists of Charaka and Suśruta, as shown in the subjoined Table, suggests a solution of the difficulty

	<i>Charaka</i> (§ 7)	<i>Suśruta</i> (§ 27)
1 Teeth	32	32
2 Sockets of teeth	32	—
3 Nails	20	—
4 Phalanges	60	60
5 Long bones	20	20
6 Clusters, or bases	4	4
7 Ankle-bones and wrist-bones	8	8
8 Heels	2	2
9 Legs and forearms	8	8
10 Knees and elbows	4	4
11 Thighs and arms	4	4
12 Shoulder-blades	2	2
13 Collar-bones	2	2
14 Back and pelvis	45	35
15 Breast	14	8
16 Ribs, &c	72	72
17 Neck and windpipe	16	13
18 Palate	2	1
19 Facial bones	4	9
20 Temples	2	2
21 Cranial bones	4	6

3 The diverging items in the two lists are Nos 2, 3, 14, 15, 17, 18, 19, 21. From among these, No 3, nails, has no place

in the system of Suśruta, and the divergences in Nos 2, 14, 17, 19, 21 depend on differences of anatomical theory which will be satisfactorily explained in the Third Section. There remain Nos 15 and 18. It is noteworthy that these are precisely the two items in which the Traditional Recension agrees with the list of Vāgbhata I (Nos 13, 24 in § 37). Seeing that in two other points, already mentioned in § 31, the Traditional Recension has been unfavourably influenced by the list of Vāgbhata I, it suggests itself as probable that in these two items also the same influence has been at work in causing the numbers eight and one to be adopted for the bones of the breast and palate respectively. As regards No 18, palate, the list of Charaka gives two as the number of the bones of the palate, and there is no apparent reason why Suśruta should be credited with changing it in his list (see § 67). As to No 15, we have a significant hint in the Non-medical Version of Ātreya's list of the bones (§ 16). The genuine list of Ātreya, as handed down by Charaka and Bheda, has only fourteen bones for the breast (No 24 in §§ 4, 12, and No 21 in § 7). The Non-medical Version of that list must have obtained its false number seventeen from some extraneous medical source, and it suggests itself that this source can have been no other than the list of Suśruta, as it stood at the time when the Non-medical Version was composed.

4 From these considerations it appears very probable that the original and genuine recension of the list of Suśruta allotted seventeen bones to the breast and two to the palate, instead of eight and one—the numbers which we now find in the Traditional Recension. The difference between these two sets of numbers ($17 + 2 = 19$, and $8 + 1 = 9$) is ten, that is to say, precisely the number we require to make good the shortage that results from the adjustments discussed in §§ 30–2. This coincidence tends to confirm the conclusion that the list of Suśruta, in its genuine form, must have given seventeen bones to the breast, and two bones to the palate.

§ 34 *Restored Recension of Suśruta's Statement*

1 We are now in a position to sum up the defects of the Traditional Recension, and restore what must have been the genuine form of the list of Suśruta

2 The Traditional Recension is wrong in the following five points

(a) It contains two misreadings (§ 29), viz abdomen (*udara*) for shoulder (*amsa*), and the phrase 'what is called collar-bone' (*akṣaka-samyā*) for 'collar-bone and shoulder-blade' (*akṣak-āmsa*)

(b) It omits four bones, viz the two shoulder-blades and the two eyeballs (§ 30)

(c) It gives the aggregate of its Nos 2, 3, 4 wrongly as ten, instead of seven (§ 31), resulting in the wrong aggregate, thirty, for the bones of a lower extremity, instead of twenty-seven

(d) It counts wrongly four heels, instead of two (§ 32), resulting in the false aggregate 120 of the bones of the four extremities, instead of 106

(e) It counts wrongly eight bones of the breast, and one bone of the palate, instead of seventeen and two respectively (§ 33) And these false counts, together with those named in lit b, result in the wrong aggregates 117 of the bones of the trunk, and 63 of the neck and head (§ 27), instead of 128 and 66 respectively

3 Accordingly, the genuine statement of Suśruta must have run as follows, the restorations being in *italics*

'The professors of General Medicine speak of three hundred and sixty bones, but books on Surgical Science know only of three hundred Of these there are *one hundred and six* in the extremities, *one hundred and twenty-eight* in the pelvic cavity, sides, back, *shoulder*, and breast, and from the neck upwards, *sixty-six* In this wise the total of the three hundred bones is made up Now in each toe of the foot there are three bones, this makes altogether fifteen Those bones which constitute the sole, cluster, and ankle are *seven* In the heel there is one, there is also one in the thigh Thus there are *twenty-seven* bones in one lower limb The same count applies to the other lower limb, and *similarly* to the two upper limbs In the pelvic

cavity there are five bones. Of these there are four in the anus, pubes, and hips, and the fifth constitutes the triangular sacrum. There are thirty-six bones in one side, and as many in the other. In the back there are thirty, *seventeen* in the breast, two each in the *collar-bone and shoulder-blades*, nine in the neck, four in the windpipe, and two in the jaws. The teeth number thirty-two. In the nose there are three bones, *two* in the palate, one each in either cheek, *eye*, ear, and temple, and six in the cranium' (Original Text in § 89)

4 The genuine list of bones as thus restored is shown in the subjoined Table

I Four Extremities

1	Phalanges (<i>anguli</i>)	$15 \times 4 = 60$	
2	Soles (<i>tala</i>)	5	
3	Cluster (<i>hūrca</i>)	1	
4	Ankle-bone (<i>gūlpha</i>)	1	
5	Heel (<i>pārsni</i>)	$1 \times 2 = 2$	
6	Legs (<i>jangha</i>)	$2 \times 4 = 8$	
7	Knee (<i>jānu</i>)	$1 \times 4 = 4$	
8	Thighs (<i>ūru</i>)	$1 \times 4 = 4$	
		—	106

II Trunk

9	Pelvic cavity (<i>śroni</i>)	5	
10	Sides (ribs, <i>pārśva</i>)	$36 \times 2 = 72$	
11	Back (<i>prsthā</i>)	30	
12	Breast (<i>uras</i>)	17	
13	Collar-bones (<i>akṣaka</i>)	2	
14	Shoulder-blades (<i>aṁśaja</i>)	2	
		—	128

III Neck and Head

15	Neck (<i>grīvā</i>)	9	
16	Windpipe (<i>kanthanāḍi</i>)	4	
17	Jaws (<i>hanu</i>)	2	
18	Teeth (<i>danta</i>)	32	
19	Nose (<i>nāsā</i>)	3	
20	Palate (<i>tālū</i>)	2	
21	Cheeks (<i>ganda</i>)	2	
22	Eyeballs (<i>akṣikṣa</i>)	2	
23	Ears (<i>karṇa</i>)	2	
24	Temples (<i>śankha</i>)	2	
25	Cranium (<i>śiras</i>)	6	
		—	66
	Grand total		300

§ 35 *Gangādhara's Recension of Suśruta's Statement*

1 Gangādhara's Recension of Suśruta's statement on the skeleton runs as follows

'In the surgical text-book of Suśruta the number of the bones of the human body is given as only three hundred. Of these there are one hundred and eight in the extremities, one hundred and twenty-six in the pelvic cavity, sides, back, collar-bones (*akṣa*), and breast, and from the neck upwards, sixty-six. In this wise, the total of three hundred is made up. Now in each toe of the foot there are three bones, this makes altogether fifteen. Those bones which constitute the sole, cluster, and ankle are seven. In the heel there is one, in the leg there are two, in the knee there is one, also in the thigh there is one. Thus there are twenty-seven bones in one lower limb. The same count applies to the other lower limb, as well as to the two upper limbs. This makes up a total of one hundred and eight bones. In the pelvic cavity there are five bones, of these there are two in the hips, and the arms, pubes, and sacrum are constituted each of one bone. In one side there are thirty-six bones, and as many in the other. In the back there are thirty, two are in what is called the collar-bone, seventeen in the breast, eleven in the neck, four in the windpipe, and two in the jaws. The teeth number thirty-two. In the nose there are three bones, two in the palate, one each in either cheek, ear, and temple, making together six, and there are six in the cranium. These make altogether sixty-six. Thus the grand total of three hundred is made up. This is the list of the bones of the skeleton' (Original Text in § 90)

2 The list may be shown in tabular form, thus

I Four Extremities

1	Phalanges (<i>anguli</i>)	$15 \times 4 = 60$
2	Soles (<i>śala</i>)	5 } $7 \times 4 \times 28$
3	Clusters (<i>kūrca</i>)	
4	Ankles (<i>gūlpha</i>)	
5	Heels (<i>pārsni</i>)	$1 \times 4 = 4$
6	Legs (<i>jaṅgha</i>)	$2 \times 4 = 8$
7	Knees (<i>jānu</i>)	$1 \times 4 = 4$
8	Thighs (<i>ūru</i>)	$1 \times 4 = 4$

II. Trunk

9	Pelvic cavity (<i>śroni</i>)	5
10	Sides (ribs, <i>pārśva</i>)	$36 \times 2 = 72$
11	Back (<i>prsthā</i>)	30
12	Breast (<i>uras</i>)	17
13	Collar-bone (<i>aksakā</i>)	2
		— 126

III Neck and Head

14	Neck (<i>grīvā</i>)	11
15	Windpipe (<i>kanṭhanādī</i>)	4
16	Jaws (<i>hanu</i>)	2
17	Teeth (<i>danta</i>)	32
18	Nose (<i>nāsā</i>)	3
19	Palate (<i>tālū</i>)	2
20	Cheeks (<i>ganda</i>)	2
21	Ears (<i>karna</i>)	2
22	Temples (<i>śankha</i>)	2
23	Cranium (<i>śiras</i>)	6
		— 66
	Grand total	300

3 Comparing the above list with that given in the preceding paragraph, it will be seen at once that it is really an attempt made by Gangādhara to restore the genuine text of the statement of Suśrūta. Moreover, it is made on much the same lines, though some of the more important defects of the Traditional Recension have escaped his attention. Thus he still counts four heels, instead of two, and omits the two shoulder-blades, and consequently his aggregates for the four extremities and the trunk are 108 and 126, instead of the true aggregates 106 and 128. He also fails to notice the omission of the two eyeballs, and hence, to make up the required total 300, he wrongly counts eleven neck-bones instead of nine. On the other hand, he rightly recognizes the error of the Traditional Recension in respect of the true number of the clusters and ankle-bones, and thus arrives at the true aggregates seven and twenty-seven, instead of ten and thirty. Similarly he recognizes the error with respect to the number of the bones of the breast and palate, restoring their true numbers seventeen and two, instead of eight and one. Further, he recognizes the misreading *udara*, abdomen, for which, however, he substitutes the insufficient reading

akṣa (short for *akṣaka*), collar-bone¹ On the other hand, his failure to realize the omission of the shoulder-blades prevented him from recognizing the misleading involved in the phrase *akṣaka-saṃjñā* (§ 29)

§ 36 *Suśruta's Statement in other Medical Works*

1 It has been mentioned in § 26 that the Traditional Recension of the statement of Suśruta is found in the two medical works, *Śārṅga Padmīnī* and *Bhāva Prakāśa*

2 In the *Śārṅga Padmīnī* (verses 70 and 71) it runs as follows

‘In the sequel, the skeleton (*kikāsa*) is explained as numbering three hundred bones in accordance with the count of the ancient Surgical Text-book There are altogether one hundred and twenty bones in the extremities, one hundred and seventeen in the pelvic cavity, sides, abdomen, breast, and back, and sixty-three in the neck and upwards Counting them, item by item, there are three hundred, but in respect of their shape, they are divisible into five classes’ (Original Text in § 91)

3 In the *Bhāva Prakāśa* the statement runs as follows

‘In the Surgical Text-book the number of bones is stated to be three hundred These, as well as their position in the body, are as follows One hundred and twenty bones are said to be in the extremities In the two sides, hips, breast, back, and abdomen,—in all these, one should know, there are altogether one hundred and seventeen In the neck and upwards there exist sixty-three bones’ (Original Text in § 92)

C THE SYSTEM OF VĀGBHATA I

§ 37 *The Statement of Vāgbhata I*

1 The system of Vāgbhata I regarding the bones of the human body is contained in the fifth chapter of the Anatomical Section (*Śārṅga Sthāna*) of his Summary, and runs as follows

¹ Possibly suggested to him by Chandraśekhara's revised text, see below, § 40

“In the body there are three hundred and sixty bones. Of these there are one hundred and forty in the extremities, one hundred and twenty in the trunk, and one hundred in the head. That is to say, in each lower limb there are five nails, three bones in each toe, aggregating fifteen, five long bones with one bone to support them, two bones each in the cluster, ankle, and leg, and one bone each in the heel, knee, and thigh. All these, nails and bones, exist also in the upper limbs exactly as in the lower. There are twenty-four ribs, and just as many sockets and tubercles. There are thirty bones in the back, eight in the breast, one each in the pubes and sacrum, two in the two hips, and as many severally in the collar-bones, shoulder-peaks (*amsa*), and shoulder-blades, as well as in the windpipe (*gatrū*) and palate jointly, thirteen in the neck, four in the windpipe (*kanthanāḍī*), and two in the jaws. There are thirty-two teeth, and as many sockets. There are three bones in the nose, and six in the cranium’

2. The total 360, detailed in the above statement, works out as shown in the subjoined Table

I Four Extremities

1	Nails (<i>nakha</i>)	$5 \times 4 = 20$
2	Phalanges (<i>anguli</i>)	$3 \times 5 \times 4 = 60$
3	Long bones (<i>śalākā</i>)	$5 \times 4 = 20$
4	Bases (<i>pratibandhaka</i>)	$1 \times 4 = 4$
5	Clusters (<i>kūrca</i>)	$2 \times 4 = 8$
6	Ankle-bones (<i>gūlpha</i>)	$2 \times 4 = 8$
7	Legs (<i>jangha</i>)	$2 \times 4 = 8$
8	Heels (<i>pārsni</i>)	$1 \times 4 = 4$
9	Knee (<i>jānu</i>)	$1 \times 4 = 4$
10	Thigh (<i>ūru</i>)	$1 \times 4 = 4$
		— 140

II Trunk

11	Ribs (<i>pārśvaka</i>)	24
	Sockets (<i>sthālika</i>)	24
	Tubercles (<i>aribuda</i>)	24
12	Back (<i>prstha</i>)	30
13	Breast (<i>uras</i>)	8
14	Pubes (<i>bhaga</i>)	1
15	Sacrum (<i>triṅka</i>)	1
16	Hips (<i>mutamba</i>)	2
17	Collar-bones (<i>aḥsaka</i>)	2
18	Shoulder-peaks (<i>amsa</i>)	2
19	Shoulder-blades (<i>amśa-phalaka</i>)	2
		— 120

III Head [and Neck]

20	Cheeks (<i>ganda</i>)	2
21	Ears (<i>karṇa</i>)	2
22	Temples (<i>śankha</i>)	2
23	Windpipe (<i>gatrū</i>)	1
24	Palate (<i>tālū</i>)	1
25	Neck (<i>grīvā</i>)	13
26	Windpipe (<i>lanthanādī</i>)	4
27	Jaw-attachments (<i>hanu-bandhana</i>)	2
28	Teeth (<i>danta</i>)	32
29	Socketts (<i>ulūkhala</i>)	32
30	Nose (<i>nāsā</i>)	3
31	Cranium (<i>śiras</i>)	6
		— 100
	Grand total	360

§ 38 *Criticism of the Statement of Vāgbhata I*

1 A comparison of the statement of Vāgbhata I with the Traditional Recensions of the statements of Charaka and Suśruta shows plainly that the former is a combination of the two latter. The list of Suśruta contains 300 bones, that of Charaka 360. Vāgbhata I adopts the list of Suśruta, and enlarges it by adopting from the list of Charaka such items as appear to be omitted by Suśruta. He does not explain his reason for proceeding in this manner, but it may be surmised to have been something of this kind. It has been pointed out in § 30 that the traditional list of Suśruta is incomplete in respect of the shoulder-blades. The omission is too conspicuous to be easily overlooked, and it would seem that Vāgbhata I had recognized it, and that he was thus caused to mistrust the exhaustiveness of Suśruta's list of 300 bones, especially as he knew that the list of Charaka included no less than 360 bones. Noticing that the list of Charaka contained several items which were absent from that of Suśruta, he concluded that the number 360 was the true total of the bones of the skeleton, and that this number might be secured by inserting, from the list of Charaka into that of Suśruta, all the apparently missing items. Of course, such a proceeding is altogether superficial and theoretical, and proves a total want of experimental knowledge of the composition of the skeleton, for, in reality (as will be shown in the Third Section, see the Table in § 46), both systems, of Suśruta as

well as Charaka, are, from their respective points of view, exhaustive. The procedure, here imputed to Vāgbhata I, may seem strange, but the evidence for it, set out in the sequel, is very strong.

2 The case may be illustrated by the subjoined Table

	I Vāgbhata	II Susruta § 27	III Charaka § 4	IV Adopted from Charaka
1 Nails	20	—	20	20
2 Phalanges	60	60	60	
3 Long bones	20	20	20	
4 Bases (<i>sthāna</i>)	4	4	4	
5 Clusters (<i>kūrca</i>)	8	8	—	
6 Ankle-bones and wrist-bones	8	8	6	
7 Legs and forearms	8	8	8	2
8 Heels	4	4	2	
9 Knees and elbows	4	4	4	
10 Thighs and arms	4	4	4	
11 Ribs, sockets, &c	72	72	72	
12 Back	30	30	45	
13 Breast	8	8	14	
14 Pubes	1	1	1	
15 ^a Sacrum	1	1	—	
15 ^b Anus	—	1	—	
16 Hips	2	2	2	1
17 Collar-bones	2	2	2	
18 Shoulder-peaks	2	—	2	
19 Shoulder-blades	2	—	2	
20 Cheeks	2	2	0 ¹	32
21 ^a Ears	2	2	—	
21 ^b Eyes	—	—	—	
22 Temples	2	2	2	
23 Windpipe (<i>gatrū</i>)	1	—	1	32
24 Palate	1	1	2	
25 Neck (<i>grīvā</i>)	13	9	15	
26 Windpipe (<i>kantha</i>)	4	4	—	
27 Jaws	2	2	3 ¹	32
28 Teeth	32	32	32	
29 Sockets of Teeth	32	—	32	
30 Nose	3	3	1 ¹	
31 Cranium	6	6	4	
Totals	360	300	360	57

¹ To Vāgbhata's Nos 20, 27, 30, aggregating 7, correspond Charaka's Nos 26, 27, 28 (§ 4), aggregating 4

3 The following points may be observed. In the first place, the list of Vāgbhata contains every item of the Suśrutiyan Traditional Recension (§ 27). To these it adds Nos 1, 18, 19, 23, 29 from the list of Charaka (§ 4), aggregating 57. This aggregate is short of the required sixty by three. From Nos 15 *b* and 25, in column II, it appears that Vāgbhata I obtained the required three by adding four to No 25 and deducting No 15 *b*, that is to say, he counted thirteen neck-bones, instead of nine, and omitted the anal bone as a separate item. The reason for his adopting this, apparently, very arbitrary proceeding can only be conjectured. The following however suggests itself. It is significant that Vāgbhata's No 25 numbers thirteen, the exact sum of Suśruta's Nos 25 and 26. Both these two items constitute the same part of the body in Sanskrit, both *grīvā* and *lanthā* denote the neck, the former referring more especially to the posterior, the latter to the anterior portion. This being so, Vāgbhata placed to the credit of No 25 the aggregate amount thirteen, which Suśruta had divided between Nos 25 and 26. But as he thus obtained one bone in excess (1 e four instead of three) he saved one bone by counting the two bones in Nos 15 *a* and 15 *b* as constituting a single bone. He could do this all the more readily as he could not help observing that in the system of Charaka (as will be shown in § 60) the sacrum and coccyx (or anal bone) constitute but a single bone, which that system includes among its forty-five bones of the vertebral column.

4 The explanation of Vāgbhata's procedure, here suggested, of course, involves the assumption of his failing to note that he counted the four bones of No 26 (1 e the windpipe) twice over, that is, once separately, in No 26, and again as included in the thirteen bones of No 25. But this is, by no means, the only instance of such inattention on the part of Vāgbhata I. We have another conspicuous example in his Nos 4 and 5, where he also counts the same bones twice over, once in No 4 as bases (*sthāna*) and again in No 5 as clusters (*lūca*), these being the Charakiyan and Suśrutiyan terms respectively for the same organ (see § 49). There is a third instance in Vāgbhata's Nos 23 and 26, where he counts the windpipe twice over,

once in No 23 under the Charakiyan term *jaṭṭu*, and again in No. 26, under the Suśrutiyan term *lanthanādī*. In fact, if the explanation, suggested above, is correct, Vāgbhata I actually counts the windpipe thrice over, in Nos 23, 25, and 26

5 The inconsistencies, or incongruities, mentioned above are not the only ones of the list of Vāgbhata I. There are others, affecting his Nos 5, 6, and 8. In No 5, he counts eight clusters (*kūrca*), that is, two in either hand and foot. But in the same fifth chapter of his Anatomical Section (*Sārva Sthāna*) he says that there are altogether only six clusters, of which, moreover, two are in the neck (*grīvā*) and penis (*medhā*), leaving only four for the hands and feet (Original Text in § 96, cl 5). According to his own statement, therefore, there is only one cluster in either hand and foot. Again in No 6, Vāgbhata I counts eight bones in the ankles, that is to say, according to the homological principle of his list, four ankle-bones (*gūḍhā*) in the feet, and four wrist-bones (*manibhanda*) in the hands. But in the seventh chapter of his Anatomical Section, treating of the 'vital spots' (*marman*), he counts only two ankle-bones and two wrist-bones (Original Text in § 96, cl 6). Again in No 8, Vāgbhata I counts four heels, that is to say, one in each of the four limbs, and thus commits the incongruity of ascribing a heel to either hand.

6 There is another incongruity in Vāgbhata's No 27, he counts two *hanu-bandhana*, or jaw-attachments. Suśruta counts two *hanu*, or jaws, and Charaka counts two *hanumūla-bandhana*, or attachments at the base of the (lower) jaw. Both are consistent views, for, as will be explained in § 65, in the system of Suśruta the two *hanu* signify the two maxillary bones (superior and inferior), while in the system of Charaka the two *bandhana* signify the two rami of the inferior maxillary. Vāgbhata I, noticing the terminological difference, but not understanding its reason, sought to compromise it by adopting the contracted term *hanu-bandhana*, or jaw-attachment, and treating it as a synonym of the simple term *hanu*, jaw, the two jaws being, in his view, as it were two attachments to the face.

7 There is a further inconsistency in Vāgbhata's omitting to count the two eyeballs (*akṣaḥosa*) in his number-list, while he

mentions them in his class-list of the very same bones (Original Text in § 93) which he adopts from Suśruta. He also adopts from Suśruta the description of the outer cover, or shell, of the eyeball as made of bone (§ 30, Original Text in § 96, cl 2). The fact is interesting, because it shows that the text of the Compendium of Suśruta, on which Vāgbhata I based his anatomical theories, was already in his time in a corrupt state. It is not probable that if Vāgbhata I had found the eyeballs included among the bones in the number-list of Suśruta, he would have omitted them from his own number-list, while it is quite credible, considering his other inconsistencies, that he should not have recognized their wrongful omission from the list of Suśruta.

8 The inconsistencies and incongruities as exposed above clearly prove that Vāgbhata I possessed no experimental knowledge of the skeleton, but that he constructed his list of its bones theoretically from the information provided in the Compendia of Charaka and Suśruta—which compendia, as we shall see in the following paragraph, he cannot have possessed in their original and genuine form, and which, from want of anatomical knowledge, he was unfitted to use critically.

§ 39 *Relation of Vāgbhata's List to the Traditional List of Charaka and Suśruta*

A comparison of the list of Vāgbhata I with the traditional lists of Charaka and Suśruta, as exhibited in the Table in the preceding paragraph, brings out the following points:

1 The principle on which the list of Vāgbhata I is constructed is to take the list of Suśruta as its basis, and add to it such items of the list of Charaka as do not occur in it.

2 The list of Suśruta which forms the basis of the list of Vāgbhata is, in every point, identical with the traditional list of Suśruta as it at present exists (§ 27). This is proved by the fact that the list of Vāgbhata shows every one of the inconsistencies which have been exposed in §§ 30–3 as existing in the Traditional Recension of Suśruta's list. That is to say (a) both reckon the aggregate of Nos 3–5 (§ 37, or Nos 2–4 in § 27) as

ten, resulting in the aggregate forty for the four extremities, (b) in order to make up that aggregate ten, both count eight clusters, and four ankle-bones and four wrist-bones, also they count four bases in addition to the four clusters, (c) both count four heels, (d) both omit the two shoulder-blades¹ and the two eyeballs, (e) both count wrongly eight bones and one bone in Nos 13 and 24 respectively

3 The list of Vāgbhata I is indebted to the list of Charaka in two ways (a) in order to raise the grand total from 300 to 360, the former adopts Nos 1, 18, 19, 23, 29 from the latter, and (b) in order to obtain the aggregate ten for Nos 3-6, it similarly adopts No 4, bases (§ 31)

4 The list of Charaka on which Vāgbhata I has drawn for his additions, is identical with the Traditional Recension of it as we have it in the manuscripts of the present day (§ 4) This is proved by the fact that both lists possess No 18, shoulders, and No 19, shoulder-blades It has been shown in § 6 that the repetition of *amsa*, shoulder, by the side of *amsa-phalaka*, shoulder-blade, is an ancient corruption of the traditional text of the list of Charaka Seeing that Vāgbhata I adopts the error into his own list, it is evident that he read the list of Charaka, as we still have it, in the traditional text of our own day The procedure of Vāgbhata I, however, explains a peculiarity of his system The shoulder-girdle contains only two separate bones, the collar-bone (*akṣaka*, No 17) and the shoulder-blade (*amsa-phalaka*, No 19), see § 56, cl 2 Finding, in his text of Charaka, the apparent mention of *amsa* as a third bone, and not suspecting an error, he appears to have explained it by taking *amsa* to refer to the so-called 'shoulder-peak' (*amsa-kūta*), or the acromion process (§ 55, cl 5) In this explanation he would probably have felt himself justified by the practice, observed by Charaka and Suśruta, of occasionally counting 'processes' of bones as separate bones (§ 44, cl 1), but in doing so, he failed to notice that with those two writers *amsa*, in its technical sense, is a synonym of *akṣaka* and denotes the collar-bone, while, when used in a loose way, it indicates the shoulder generally (§ 55, cl 4)

¹ The two shoulder-blades, it is true, appear in the list of Vāgbhata I, but they have been adopted into it from the list of Charaka

Vāgbhata I's ill-conceived interpretation of the term *amsa* led to another unfortunate result, inasmuch as it appears to have served as the basis of the definition of *amsa*, which is given in the *Amarakośa*, the famous Vocabulary of Amarasimha, and which, in its turn, led to the misinterpretation of the term *jatru*, see § 62, cl 8

§ 40 *The Relative Date of the Three Lists*

1 We are now in a position to draw certain conclusions regarding the approximate dates of the traditional lists of Charaka and Suśruta in relation to the list of Vāgbhata I

2 It has been shown in the preceding paragraph that the list of the bones of the human body as constructed by Vāgbhata I is substantially identical with the lists of Charaka and Suśruta as we possess them in the manuscripts of the present day. Moreover, at least three corruptions of the latter two lists, viz the repetition of *amsa*, shoulder, in the list of Charaka (§ 6), and the omission of the shoulder-blades and the eyeballs in the list of Suśruta (§ 30), must have existed in their texts already in the time of Vāgbhata I, for, as explained in the two preceding paragraphs the construction of his list presupposes them. Accordingly both lists, in their traditionally corrupted form, must be anterior to the date of Vāgbhata I whatever the latter may be. On the other hand, it has been shown (pp 76, 79, 85), regarding the omission of the shoulder-blades and eyeballs, and the count of seventeen bones in the neck, that the Non-medical Version of Atreya's system presupposes the knowledge of a recension of Suśruta's text which was more correct, and therefore presumably older than the corrupt traditional text. Similarly the Non-medical Version which ignores the erroneous repetition of *amsa*, shoulder (§§ 6, 16, 17), presupposes the knowledge of an older and more correct recension of the text of Charaka. Accordingly at the time when the Non-medical Version was composed, both the lists of Charaka and Suśruta must have existed in the earlier uncorrupted form, and the corrupt recension, traditionally handed down, must have come into existence at a later date that is to say, between the date

of the Law-book of Yājñavalkya, which contains the Non-medical Version, and the date of the construction of the list of Vāgbhata I. As the date of the Law-book is about 350 A D (§ 14), the origin of the two traditional recensions cannot be placed earlier than the fourth century A D.

3 The question suggests itself whether Vāgbhata I himself might not be the author of the Traditional Recension of the statement of Suśruta on the bones of the human body. The evidence is not sufficient to return a decided answer, but whatever evidence there is seems certainly to point in that direction. The statement of Suśruta (§ 27) gives the aggregate of the bones contained in Nos 2, 3, 4 of his list, but does not detail the number of bones of each item: sole (*tala*), cluster (*lūca*), and ankle (*gūpha*). Whoever fixed the details so as to make the sole (*tala*) to include not only the five long bones (*śalākā*) but also the base (*sthāna*), must have been led to do so by noticing that the list of Charaka mentions the base (*sthāna*), while the list of Suśruta does not name it. He concluded, therefore, that Suśruta's term sole (*tala*) must cover both the long bones (*śalākā*) as well as the base (*sthāna*). In other words, whoever fixed the details proceeded on the principle of adding to the list of Suśruta such items from the list of Charaka as did not appear to be contained in it explicitly. This, as has been shown in § 39, is precisely the principle on which Vāgbhata I worked in constructing his own list. It seems probable, therefore, that it was Vāgbhata I who for the purpose of preparing his own list, constructed the Traditional Recension of the list of Suśruta.

4 It is a well-known fact that the text of Suśruta's Compendium, after a time, fell into some disorder, which necessitated revision or reconstruction. Several such revisions, or reconstructions, must have been undertaken at different times. The first reconstruction may have been that to which we owe the addition of the Supplementary Section (*Uttara Tantra*). This is traditionally ascribed to Nāgārjuna, in the second century A D (§ 2). Seeing that the traditional text of neither Charaka nor Suśruta existed about 350 A D, the approximate date of the Law-book of Yājñavalkya, it follows that Nāgārjuna, if he made any recon-

struction of the text of Suśrūta's Compendium, can at all events not be credited with the particular reconstruction of Suśrūta's statement on the skeleton. Another revision was made by Chandrāta, the son of Tīṣata. He states this fact himself at the end of his revised text, which he calls a *pāṭha-sūddhi* or 'Emendation of the Text'. We have a copy of this revised text in the unique manuscript of the India Office Library, No 1842 (Cat No 2646), described on pp 927, 928 of the catalogue. So far as a cursory examination permits one to judge, it does occasionally, though not very materially, differ from the Traditional Recension of the Compendium. But in the statement on the skeleton there occurs a noteworthy *varia lectio*. Instead of the erroneous reading *udāra*, abdomen, of the traditional text (§ 29), Chandrāta's text has *aḥṣa*, collar-bone¹. This circumstance—so far as it goes—makes against the hypothesis that Chandrāta was the author of the Traditional Recension. But there are two stronger objections to it in Chandrāta's late date and comparative obscurity. The date of Chandrāta is not known, but it cannot well be earlier than the ninth or tenth century, because in his Commentary on the *Cikitsā-lāṭhā*² of his father Tīṣata he quotes from the complement of Charaka's Compendium, which was made by Dṛḍhabala, and the date of the latter must be in the eighth or ninth century (§ 2, cl 9). He does not quote Bhoja³, while both Chakrapāṇidatta and Gayadāsa quote him, but do not quote each other. Hence it appears probable that the last-mentioned two authors were near contemporaries who were preceded by Bhoja who himself was preceded by Chandrāta. As the date of Chakrapāṇidatta is about 1060 A D, the date of Chandrāta may be referred to about 1000 A D. As to the point of obscurity, so much may be taken as certain, that whoever was the author of the Traditional

¹ Also adopted by Gangādhara (§ 35), possibly from Chandrāta.

² See Professor Jolly's article in the *Journal, German Oriental Society*, vol 1x, pp 413 ff.

³ Once however, Bodleian MS (Fiaseri No 21, Cat No 852), fol 96 b, he quotes Bhoja the elder (*vrddha Bhoja*). The earliest mention of Chandrāta, known to me, occurs in Śrīkanthadatta's commentary on the *Siddhayaoga* (Poona ed, p 552). The date of Śrīkantha, a pupil of Vijaya Rakṣita, is about 1260 A D.

Recension must have been a person of great reputation, for otherwise it is inconceivable how his recension should have obtained such paramount authority as to supersede every other recension, and to be the only one found in all existing manuscripts, and exclusively commented on in all known commentaries¹ Chandīata certainly cannot be said to have held such a position. The only ancient medical author who by the uniform tradition of India holds a place equal to that of Charaka and Suśruta is Vāgbhata I. He is the third in the traditional triad of great representatives of Indian medicine. Charaka, Suśruta, Vāgbhata². It has been shown (§§ 38, 39) that the principle on which the Traditional Recension of the statement of Suśruta is made is certainly one on which Vāgbhata I worked in constructing his own statement. The conclusion therefore seems unavoidable that it was Vāgbhata I who is the author of that Traditional Recension. The fact that the older recensions still existed in the fourth century A D, at the date of the Law-book of Yājñavalkya, and the consideration that a sufficient interval must be conceded for the text to have fallen into such a state of corruption as to necessitate a thorough revision, or reconstruction, will accord with the early seventh century A D as the date of Vāgbhata I, already suggested by other considerations (see § 2). It should, however, be distinctly understood that these conclusions regarding the date and authorship of Vāgbhata I are not put forward as established facts. They are, for the present, no more than historical speculations, or rather a working hypothesis, based on more or less conclusive evidence.

NOTE.—Whatever may be thought of the suggested authorship of the traditional text of Suśruta, there is distinct evidence of the text of Suśruta's Compendium having been liable to be affected by the theories of Vāgbhata I. For example, according to Suśruta's doctrine, in the Anatomical Section (*Sāra Sthāna*),

¹ This remark refers particularly to the Traditional Recension of the statement on the skeleton, which is the only one known to, and commented on by Gaṇadāsa and Dallana. They give no indication of being aware of the existence of any other recension of that particular passage.

² See Professor Jolly's *Indian Medicine*, § 9. See also p 10 for the testimony of the Chinese pilgrim Hsüan Tsang.

chapter v, clause 33 (Original Text in § 94, cl. 1), there are altogether 500 muscles in the human body. Of these 500 muscles, 400 go to the four extremities, while there are 66 in the trunk and 34 in the neck and head. This is the traditional reading of that doctrine, as printed by Jīvānanda, p. 334, and supported by existing manuscripts. Dallana, in his Commentary (Jiv ed., p. 578), accepts that reading, but expressly states that Gayadāsa's Commentary followed a different reading, which allotted 60 muscles to the trunk and 40 to the neck and head, and he adds that this distribution of the muscles is also taught by Vāgbhata I. Dallana's statement is verified by the Cambridge MS of Gayadāsa's Commentary,¹ and the printed text of Vāgbhata's Summary (*Aṣṭāṅga Samgraha*), vol. 1, p. 225, line 21.

§ 41 *The Origin of the Traditional Recension*

1 The homological character of the skeletal structure is too conspicuous in the four extremities to have escaped the notice of Ātreyā-Charaka. But that he did not fully realize it, is shown, *inter alia*, by his treatment of the cranial bones, as compared with that of Suśrūta (see §§ 28, 63). It was the latter who first recognized that the homological principle dominated the whole structure, and who explicitly used it as the basis of his classificatory list of the bones. This is shown, e.g., by his distribution of the ribs into two sets of 36 bones each (§ 27), and by his hemisection of the vertebral column and of the frontal and other bones of the head (§§ 44, 59-63). In one point, however, viz. the ascription of three bones to each digit (p. 73), Suśrūta pressed the homological principle too far; see § 47. Vāgbhata I adopted that principle from Suśrūta, but pressed it one point farther, extending it, still more erroneously (at least, in the sense in which he applied it) to the heels, of which he counted four, ascribing heels to the two hands as well as to the two feet.

¹ Unfortunately the clause referring to the muscles is very badly mutilated in the MS, but sufficient of it still remains to confirm Dallana's statement. See my Article on the *Commentaries on Suśrūta*, in the *Journal of the Royal Asiatic Society* for 1906.

2 It is Vāgbhata's extended application of the homological principle which explains the origin of the Traditional Recension of Suśruta's list of the bones. That list (§ 27) states only the aggregate of the three items (Nos 2, 3, 4), sole (*śālā*), cluster (*kūṇca*), ankle (*gūlpha*). In order to determine the details of this aggregate, Vāgbhata I consulted the list of Charaka. Here (§ 4) he found the three items, No 5, long bones (*śālākā*), No 6, base (*sthāna*), No 8, ankle (*gūlpha*). Failing to notice that the bases of Charaka were equivalent to the clusters of Suśruta, he concluded that Suśruta's sole (*śālā*) must include the long bones (*śālākā*) as well as the bases (*sthāna*) of Charaka's list, and he thus set up four items: long bones, base, cluster, ankle, as identical with Suśruta's three items: sole, cluster, ankle. Further, noticing that the list of Charaka counted four ankle-bones in the two feet (No 8 in § 4), he allotted two bones to Suśruta's ankle, and similarly two bones, to his cluster, forgetting that Suśruta himself had elsewhere allotted only one bone to either, the cluster and the ankle¹. Such would seem to have been the consideration on which Vāgbhata I arrived at the details of his own four (or Suśruta's three) items, as thus

sole	{	long bones, 5 bones	} aggregate 10 bones
		base, 1 bone	
		cluster, 2 bones	
		ankle, 2 bones	

Next, on the principle of homology, he multiplied this aggregate by four, obtaining forty as the grand aggregate of the bones of his four items in the four extremities. By a further, but erroneous, application of the same principle to Suśruta's No 5, heel (*pāśu*), he obtained his four heels, and the correct application of it to Suśruta's Nos 6, 7, 8 (§ 27) gave him another set of sixteen bones. Totalling the sums so far obtained ($16 + 40 + 4 + 16 = 80$), and adding the sixty phalanges (No 1 in § 27), Vāgbhata arrived at the grand total of one hundred and twenty for the bones of the four extremities.

3 Let us remember that the list of Suśruta in its original

¹ The fact that Suśruta looked upon the ankles of the foot as constituting but one bone, is illustrated by the term *valaya*, anklet, which he applies to them. The *valaya* is a heavy bangle worn on the foot, see Fig. 2 illustrating § 30.

form counted seventeen bones in the breast and two in the palate (§ 33) The numbers in that list must have been as below

<i>Trunk</i>			<i>Neck and Head</i>		
9	Pelvis	5 bones	14	Neck	9 bones
10	Sides	72 „	15, 16	Windpipe, jaw	6 „
11	Back	30 „	17	Teeth	32 „
12	Breast	17 „	18, 19	Nose, palate	5 „
13	Collar-bones	2 „	20-3	Cheeks, &c	12 „
Total 126 „			Total 64 „		

Accordingly Suśruta's list would have contained the following totals

Four Extremities (as calculated by Vāgbhata I)	120
Trunk	126
Neck and Head	64
Grand total	310

This grand total having ten bones in excess of the required 300, it became necessary for Vāgbhata I to make a corresponding reduction somewhere. He determined to make it in the bones of the breast and palate, reducing their numbers from seventeen and two (= 19) to eight and one (= 9) respectively—an operation which gave him just the required ten (19-9). It may be asked what made him select for reduction just those two items, the breast and palate. The answer to this question can only be conjectured, but what may be said on the subject will be found explained in the Third Section (§§ 57 and 67). Of course the process here suggested by which the Traditional Recension of Suśruta's statement on the skeleton was constructed is purely speculative—it may or may not have so happened, but to myself it appears to possess much probability.

D THE SYSTEM OF THE VEDAS

§ 42 *The Statements in the Śatapatha Brāhmaṇa*

1 It may be useful to present in their entirety those passages from the *Śatapatha Brāhmaṇa* to which I have briefly referred in some of the preceding paragraphs. They occur in the tenth and

twelfth sections (*kāṇḍa*) of that work, in the course of describing the erection of the fire-altar. In the building of it, 360 bricks were used together with the chanting of hymns consisting of a varying number of verses. With these bricks and hymns the body and certain of its parts are compared in a mystical way.

2 *Total Number of Bones* In the tenth section (*kāṇḍa*), fifth chapter (*adhyaṃya*), fourth paragraph (*brāhmaṇa*), and twelfth clause the total number of the bones of the human body is compared to the 360 bricks of the fire-altars, as follows¹

‘But indeed that fire-altar also is the body—the bones are the enclosing stones, and there are 360 of these, because there are three hundred and sixty bones in man, the marrow-parts are the *yajusmatī* bricks, for there are three hundred and sixty of these, and three hundred and sixty parts of marrow in man’ (Vol. IV, p. 387, Original Text in § 99, cl. 1)

Again in Section XII, 3, 2, clauses 3 and 4

‘There are three hundred and sixty nights in the year and three hundred and sixty bones in man, and these (two) now are one and the same,—there are three hundred and sixty days in the year, and three hundred and sixty parts of marrow in man, and these (two) now are one and the same. And there are seven hundred and twenty days and nights in the year, and seven hundred and twenty bones and parts of marrow in man, and these (two) now are one and the same’ (Vol. I, p. 169, Original Text in § 99, cl. 1)

3 *Bones compared to Hymns* The number of bones in certain parts of the body are compared to certain hymns in Section XII, 2, 4, clauses 9–14, as follows (Original Text in § 99, cl. 3)

‘(9) The three-versed hymn-form (*trīṣṭ*) is the head (*śiras*), whence that (head) is threefold—skin, bone, and brain. (10) The fifteen-versed hymn-form (*pañcadaśa*) is the neck-bones (*grīvāḥ*), for fourteen of these are the transverse processes (*karūḥkara*), and then strength (*vīrya*) is the fifteenth, hence by means of them, though small, man can bear a heavy load. Therefore the fifteen-versed hymn is the neck-bones. (11) The seventeen-versed hymn-form (*saptadaśa*) is the breast (*śiras*), for there are eight costal cartilages (*jaṭin*) on the one side, and eight on the other, and the breast-bone (*śiras*, sternum) is the seventeenth

¹ The translations are taken from, or based on, Professor Eggeling's Translation in the *Sacred Books of the East*, vols. IV and V.

Therefore the seventeen-versed hymn is the breast. (12) The twenty-one-versed hymn-form (*ekavimsā*) is the abdominal portion (*udara*) of the spine. For within the abdomen there are twenty transverse processes (*khantāpa*), and the abdominal portion of the spine is the twenty-first. Therefore the twenty-one-versed hymn is the abdominal portion of the spine. (13) The thrice-nine-versed (or 27-versed) hymn-form (*trīnava*) is the two sides (*pāśva*). There are thirteen ribs (*parśu*) on the one side, and thirteen on the other, and the two sides make up the thrice-ninth (or 27th). Therefore the thrice-ninth hymn is the two sides. (14) The thirty-three-versed hymn-form (*trayastrimsā*) is the thoracic portion (*anūha*) of the spine, for there are thirty-two transverse processes (*khantāpa*) in it, and the thoracic portion of the spine is the thirty-third. Therefore, the thirty-three-versed hymn is the thoracic portion of the spine' (Vol v, pp 163-5)

4 *Position of Costal Cartilages* The position of the costal cartilages is described in Section VIII, 6, 2, clauses 7 and 10, as follows

'(1) The *tristubh* (metres) are the breast-bone (*uras*) he (i.e. the sacrificer) places them on the range of the two *retahsū* (bricks), for the *retahsū* (bricks) are the back-bones (*pasti*), and the back-bones lie over against the breast-bone. (10) The *bṛihatī* (metres) are the ribs (*parśu*), the *kakubh* (metres) are the thoracic vertebrae (*kikasa*). The *bṛihatī* he places between the *tristubh* (metres) and *kakubh* (metres), whence these ribs (*parśu*) are fastened, at either end, to the thoracic vertebrae (*kikasa*) at the back and (interiorly) to the costal cartilages (*gatiu*) in front' (Vol iv, p 114, Original Text in § 99, cl 4)

5 *Date of Satapatha Brāhmaṇa, and its Relation to Charaka and Susruta* The traditional author of the *Satapatha Brāhmaṇa* is Yājñavalkya, who is said to have flourished at the court of Janaka, the famous king of Videha, and contemporary of Ajātasattu king of Kāśī (Benares). The latter, the celebrated ruler of Magadha and Kāśī, was a contemporary of Buddha. His accession took place approximately in 491 B.C. Accordingly Yājñavalkya may be dated about 500 B.C.¹ The anatomical

¹ On the dates see Weber's *History of Indian Literature* (3rd English ed.), pp 116 ff., Prof Eggeling's *Translation of the Satapatha Brāhmaṇa* in vol. xii of the *Sacred Books of the East*, Introd., pp xxv ff., Prof Rhys Davids' *Buddhist India*, pp 12-16,

comparisons, quoted above, show that in his time both the medical schools of Ātīya and Suśruta were in existence, and that he possessed some knowledge of their respective theories on the skeleton. For he derived from Suśruta the allotment of seventeen bones to the breast (§§ 33, 34), Ātīya-Charaka counting only fourteen (§ 4), while he got the total of 360 bones of the skeleton from Ātīya, Suśruta having only 300. In his choice of particulars from the two systems, of course he was guided by the requirements of his mystic treatment of the fire-altar. As to Suśruta's surgical text-book, it may be noted that Yājñavalkya was a native of Eastern India, and that Indian surgical science, in all probability, took its origin in that part of India (§ 2, cl 3).

6 *Acquaintance with Suśruta* Yājñavalkya's acquaintance with the system of Suśruta is further shown by the curious circumstance that he counts 360 marrow-parts, that is, as many as there are bones. Clearly, he believed that every bone contained a 'marrow-part'. This belief is closely related to Suśruta's doctrine, which also ascribes what may be called a 'marrow-part' to every bone. Charaka has left no statement on the subject, but Suśruta, in the Introductory Section (*Sūtra Sthāna*) of his text-book (ch. xiv, verse 6, Jīv. ed., p. 48, Original Text in § 99, cl 2), teaches that 'from fat (*medas*) originates bone, and from the latter marrow (*majjā*)'. In the Anatomical Section (*Sārva Sthāna*, ch. iv, cl 9, Jīv., p. 319, Original Text in § 99, cl 2), he further states that 'fat (*medas*) occurs in the abdomen, and in both the small and large bones of all beings', and, *ibid.*, cl 10, he explains that 'the fat which is found in the interior cavity of the large bones is called marrow (*majjan*), while that which is found in all other bones is called bloody (*sa-akta*, or red) fat, further the grease (*sneha*) which attaches to clean flesh (of the abdomen) is known as suet (*vasā*), while in all other conditions fat (*medas*) is simply denoted grease (*sneha*)'. In the view of Suśruta, therefore, all bones contain the same fatty tissue (*medas*) only it is red in the small bones, and yellow in the large ones, the

Mr V. Smith's *Early History of India*, pp. 26 ff., Messrs. Hoernle and Stark's *History of India*, p. 21.

latter kind being distinguished as marrow (*majjan*) The author of the *Śatapatha Brāhmana* only differs in employing the term *majjan* in the sense in which Suśruta uses the term *medas*¹

7 *Confused Counting in the Śatapatha Brāhmana* In the enumeration of the bones of the trunk, the author of the *Śatapatha Brāhmana*, not being a medical man, but a theologian, is rather confused The items of his count are

In the Neck	15 bones
„ Breast	17 „
„ Lower Spine 21 }	54 „
„ Upper Spine 33 }	27 „
„ Ribs	

Here the first two items are correct, being taken from Ātreya-Chaiaaka (§ 4) and Suśruta (§ 35) respectively But the numbers of the bones of the spine and the ribs, 54 and 27 respectively, are very strange It almost looks as if they were due to a misreading, or false recollection, reversing the true numbers 45 and 72² The former (i e 45) is the total of the bones of the spine in the system of Ātreya-Chaiaaka (§ 4), while the latter (i e 72) is the total number of the ribs with their sockets and tubercles in both systems, of Ātreya as well as of Suśruta

8 *Continuation* But further, the principle of counting is no less confused Suśruta counted the bones of the breast on a principle different from that on which he counted the bones of the neck and back (that is, of the whole spine) The breast he counted by taking it to consist of a median bone (*sternum*), giving off an equal number of branch bones (costal cartilages)

¹ It deserves notice that also modern Anatomy distinguishes between red and yellow marrow, the latter being found in the medullary cavity of the long bones, the red in the cancellous parts of those bones as well as in all other bones The red marrow has its name from the blood-vessels in it, while the yellow has its name from the oil gradually developed in it The yellow kind is what is popularly known as marrow, and which Suśruta distinguishes as *majjan* See Gerish, *Textbook of Anatomy* (2nd ed, 1903), pp 53, 113

² Misreading would be an obvious solution, if we could assume that at the time of the composition of the *Śatapatha Brāhmana* the system of numeral notation based on 'the value of position' was already known With the older system of notation by means of distinct signs for the tens and for the units, the theory of misreading is far less intelligible It must, then, be a case of false recollection

on either side But in the spine, he counted each vertebra separately without any median column Ātīya-Charaka, less correctly, had applied the former method of counting also to the neck (§ 61) In the *Śatapatha Brāhmaṇa*, even more confusedly, it is extended to the whole of the spine The latter is supposed to consist of a median column, divided into an upper (*anūka*) and a lower (*udara*) portion, either of them giving off an equal number of branch bones (transverse processes) on either side

9 *Continuation* As to the ribs, the very non-anatomical view is taken of counting the collar-bones as a species of ribs, and thus obtaining a total of thirteen ribs on either side of the sternum This explanation of the otherwise unintelligible count of thirteen ribs has been suggested by Professor Eggeling in his Translation of the *Śatapatha Brāhmaṇa* (*Sacred Books of the East*, vol xlv, p 164, footnote 2), and is undoubtedly correct The fanciful count itself, of course, is due to the mystical exigencies of the author of the *Śatapatha Brāhmaṇa*

10 *Continuation* Finally, another quite non-anatomical procedure of the same author is the description of the head (or rather, cranium, *śiras*) as consisting of skin, bone, and brain

§ 43 *Statement in the Atharva Veda*

1 The hymn on the creation of man, which is referred to in § 2, cl 2, is the second in the tenth book of the Atharva Veda Its composition is traditionally ascribed to a certain sage (*ṛṣi*) Nārāyaṇa This sage is the traditional author also of the famous hymn on the sacrifice of man (*puruṣa-sūkta*), which is found both in the Rīgveda and the Atharva Veda, and is regarded as 'one of the very latest poems of the Rīgvedic age'—an age 'which can hardly be less remote than 1000 B C'¹ It seems probable that he is identical with the Nārāyaṇa, to whom Indian medical tradition ascribes the composition of certain very ancient medical formulae,² and who, from all these considerations, comes

¹ See *Rīgveda*, x 90, and *Atharva Veda*, xiv 6, Professor Macdonell's *Sanskrit Literature*, pp 44, 47, 133

² One formula for the preparation of a medicated oil has the very early authority of the Bower MS, Part III, verses 37-53 Another formula for preparing a compound powder is recorded in

within the semi-mythical period of the history of Indian medicine (§ 2, cl 2)

2 The initial eight verses of the hymn in question run as follows¹ (Original Text in § 100)

Verse 1 By whom were fixed the two heels of man? By whom was the flesh constructed? By whom the two ankle-bones, by whom the slender digits, by whom the apertures, by whom the two sets of long bones, in the middle? Who made their bases?

Verse 2 How did they (the devas) make the two ankle-bones of man below, and the two knee-caps above? The two legs, furthermore—how, pray, did they insert (them)? and the two knee-joints—who conceived them?

Verse 3 A four-sided (frame) is formed by their ends being firmly knit together Above the two knees (there is) the pliant abdomen The two hips and the two thighs that there are, who has created them, (those props) through which the trunk becomes so firmly set up?

Verse 4 How many devas, and who among them, contributed to build up the (bones of the) breast and the (cartilages of the) windpipe of man? How many disposed (the ribs of) the two breasts, who, the two shoulder-blades? How many piled up the neck-bones, how many, the back-bones?

Verse 5 Who constructed the two arms of his for the exertion of strength? Which deva hoisted the two collar-bones on his trunk?

Verse 6 Who pierced the seven apertures in the head the two ears, two nostrils, two eyes, the mouth—these (organs of sense) in whose surpassing might quadrupeds and bipeds walk their way in all directions?

Verse 7 For within the two jaws he fixed the tongue, and installed the far-reaching mighty voice The devas pervade the

Mādhava's *Siddhayaoga*, ch xxvii, verses 18–25 (p 307), and Dīdhābala's complement to the *Charaka Saṃhita*, *Ōkṛtsita Sthāna*, ch xviii, verses 122–9 (p 649, ed 1895)

¹ Several of the Sanskrit terms, occurring in this hymn, are very rare On these and other philological matters my *Studies in Ancient Indian Medicine*, No II, in the *Journals of the Royal Asiatic Society* for 1906, pp 915 ff, and 1907, pp 1 ff, may be consulted

(three) worlds, they dwell in the waters, but which of them conceived it?

Verse 8 Whoever first constructed that brain of his, the brow, the facial bone, the cranium, and the structure of the jaws, and having done so, ascended to heaven, who of the many devas was he?

3 The significance of these verses comes out very clearly, when the system of the bones of the human body disclosed in them is compared with the osteological systems of Ātreya-Charaka and Suśruta. The three systems are shown in the subjoined Table, the arrangement of which follows the order of the verses in the hymn of the Atharva Veda. The systems of Charaka and Suśruta, in columns V and VI, are quoted from § 7 and § 34 respectively, and the bracketed numbers in the columns refer to the order of the bones in those paragraphs.

I VER	II No	III NAME OF BONE	IV ATHARVA VEDA	V ĀTRĪYA-CHARAKA (§ 7)	VI SŪSŪTA (§ 31)
1	1	Heel	<i>pārsni</i>	<i>pārsni</i> (7)	<i>pārsni</i> (5)
	2	Ankle-bone	<i>gulpha</i>	<i>gulpha</i> (8) and <i>manila</i> (9)	<i>gulpha</i> (4)
	3	Digit	<i>angula</i>	<i>angula</i> (4) with <i>nakhā</i> (3)	<i>angula</i> (1)
	4	Long bones	<i>uchlakṣu</i>	<i>śālākā</i> (5)	<i>tala</i> (2)
	5	Base	<i>pratisṭhā</i>	<i>adhusthāna</i> (6) (or <i>sthāna</i>)	<i>kūca</i> (3)
2	6	Knee-cap	<i>asṭvat</i> (or <i>jānu</i>)	<i>jānu</i> (12) and <i>kapāla</i> (13)	<i>jānu</i> (7)
	7	Leg-bones	<i>jāgha</i>	<i>jāgha</i> (11) and <i>aratni</i> (10)	<i>jāgha</i> (6)
3	8	Pelvic cavity	<i>śroni</i>	<i>śroni-phalaka</i> (18) with <i>bhaga</i> (19)	<i>śroni</i> (9)
	9	Thigh bone	<i>ūru</i>	<i>ūru-nalaka</i> (14) and <i>bāhu-nalaka</i> (15)	<i>ūru</i> (8)
4	10	Breast-bone	<i>uras</i>	<i>uras</i> (21)	<i>uras</i> (12)
	11	Windpipe	<i>grīvā</i>	<i>jatru</i> (24) (or <i>grīvā</i> , § 62)	<i>kantlianādī</i> (16) (or <i>jatru</i> , or <i>grīvā</i>)
	12	Rib-piece (ribs)	<i>stana</i>	<i>pārśvaka</i> with <i>sthālaka</i> , <i>ambula</i> (22 ^{a-c})	<i>pārśva</i> (10)
	13	Shoulder-blade	<i>kaphoda</i>	<i>amsa-phalaka</i> (16)	<i>amsa</i> (14) (or <i>amsa-phalaka</i>)
	14	Neck-bones	<i>skandha</i> (plur.)	<i>grīvā</i> (23)	<i>grīvā</i> (15)
5	15	Back-bones	<i>prsti</i> (plur.)	<i>prsthāsthī</i> (20)	<i>prsthā</i> (11)
		THE UPPER EXTREMITIES (<i>bāhu</i>) here briefly mentioned			
8	16	Collar-bone	<i>amsa</i>	<i>aksaka</i> (17) (or <i>amsa</i> § 55)	<i>aksaka</i> (13) (or <i>amsa</i>)
	17	Brow	<i>lalāta</i>	<i>nāśikā-gandakūṭa-lalāta</i> (28)	{ <i>nāsā</i> (19), <i>ganda</i> (21), <i>akṣ-</i>
	18	Central Facial Bone	<i>kakāṅkā</i>		{ <i>kosa</i> (22), <i>karna</i> (23)
	19	Cranium with Temples	<i>kapāla</i>	<i>kapāla</i> (30) with <i>śankha</i> (29)	<i>kapāla</i> (25) with <i>śankha</i> (21)
		ples		<i>danṭa</i> (1) with <i>danṭotāṭhala</i> (2)	<i>danṭa</i> (18)
				<i>tālūśaka</i> (25)	<i>tālū</i> (20)
				<i>hanvasthī</i> (26) with <i>hanu-mūla-ban-</i>	<i>hanu</i> (17)
				<i>dhana</i> (27)	
	20	Structure of Jaws	<i>hanvoh cṭya</i>		

4 It will be noticed in the preceding table that while the several items, taken singly, do not follow one another in the Atharvic column IV in exactly the same order as in the Charakiyan and Suśrutīyan columns V and VI, they do so nevertheless, if regard is had mainly to their grouping in the Atharvic verses (col I). The only exception to this rule is the collar-bone (No 16 in col II), which occupies a rather different place in columns V and VI. It is not difficult, however, to see the reason of this exception. The Atharvic hymn mentions the collar-bone, in verse 5, in connexion with the mention of the upper limb (*bāhu*) which serves to join it to the trunk.

5 A much more important point to observe is that, as the table shows, the system of the Atharva Veda more nearly approaches the system of Ātreya-Charaka than that of Suśruta. The only point of agreement in the Atharvic and Suśrutīyan systems is that both content themselves with a brief reference to the bones of the upper extremities (as being alike to those of the lower extremities), but do not enumerate them separately as the Charakiyan system does. This, however, is a merely formal and unimportant point. A really important circumstance is that the Atharvic system shares with the Charakiyan one of the most striking points, in which the latter differs from the system of Suśruta, namely, the assumption of a central facial bone in the structure of the skull (Nos 17 and 18 in the Table, see also § 11, cl 5, § 13, cl 4, § 17, cl 4, § 23, cl 3 b). This is a point which will be found fully explained in § 66. It may be added that the Atharvic term *matisthā* for the base of the long bones (No 5 in the Table) obviously agrees with the Charakiyan term *adhīsthāna*, and widely differs from the Suśrutīyan *kūrca*. The closer agreement of the system of the Atharva Veda with that of Ātreya-Charaka is nothing more than might have been expected from their closer chronological position, as explained in § 2, cl 4. The two circumstances suggest mutual confirmation.

6 It also deserves notice that the Atharvic system knows only of two bones as constituting the shoulder-girdle—viz the collar-bone (*amsa*, No 16 in the Table) and the shoulder-blade (*laphoda*, No 13). It thus serves to confirm the correctness

of omitting the item *amsa* from the osteological summary of Charaka (§ 6, and § 25, Note) The two systems, of the Atharva Veda and Ātreyā-Charaka, being in other respects in such close agreement, it becomes increasingly probable that the latter system likewise knew only of two bones in the shoulder, viz the collar-bone (*akṣaka*, No. 17 in § 7) and the shoulder-blade (*amsa-phalaka*, No 16, *ibid*)

SECTION III

ANATOMICAL IDENTIFICATIONS

§ 44 *Preliminary Remarks*

1 BEFORE proceeding to the detailed identification of the bones which, according to the early Indian anatomists, compose the human skeleton, it may be useful to note the following preliminary points

2 According to modern Anatomy, there are about 200 bones in the adult human skeleton¹ The early Indian anatomists, on the other hand, count either 360 (Ātreya) or 300 (Suśruta) bones This large excess is principally due to the fact that (besides including the teeth nails, and cartilages) they counted prominent parts of bones, such as are now known as 'processes' or 'protuberances', as if they were separate bones Their reasons for counting in this manner were mainly three

3 Sometimes processes, or protuberances, of bones were popularly known by special names, and regarded as special bones Examples are the malleoli, or ankle-bones, and the styloid processes, or wrist-bones In such cases it was probably a mere concession, made by the early Indian anatomists, to popular usage that they enumerated them in their lists as separate bones In other cases the separate enumeration of processes or protuberances was due to an exaggerated regard for the homological principle For example the right and left halves of the skeleton were regarded as homologous Hence, seeing that the vertebral column lay in the median line, the transverse processes on the right and left of the several vertebrae were counted as separate homologous bones (§ 59) Sometimes, again, it was a fancy for artificial symmetry which led to the multiplication of bones To this cause, probably, is due the

¹ See Dr Gemish's *Textbook of Anatomy*, p 113

assumption of the existence of a third joint in the thumb and great toe (§ 47), and of twelve costal tubercles instead of ten (§ 58)

4 All these cases are examples of the multiplication of bones, but the opposite process of unification also occurs. Here a number of bones is counted as a single bone, either from deference to an older or popular theory, or because they were thought to constitute a peculiar unity. Conspicuous examples are the bones of the carpus and tarsus (§ 49), and, in Suśruta's system, the ankle-bones (§ 52)

§ 45 *The Practice of Dissection*

1 Allowing for the modifying causes explained in the preceding paragraph, the views of the early Indian anatomists are surprisingly accurate. This is due to the fact that they were accustomed to the practice of preparing the dead human body for actual examination, and that, therefore, their views were the direct result of an experimental knowledge of the skeleton. It is true that the Compendium of Charaka contains no reference whatever to the practice of human dissection, and it must, therefore, remain doubtful whether, and to what extent, that practice was observed in the school of Atreya. But there can be no doubt as to the practice being known and observed in the school of Suśruta, for his Compendium contains a passage which gives detailed instructions regarding the procedure to be adopted in preparing a dead body for anatomical examination.

2 The passage in question occurs at the end of the fifth chapter of the Anatomical Section (*Śārīra Sthāna*) of the Compendium and runs as follows

‘No accurate account of any part of the body, including even its skin, can be rendered without a knowledge of anatomy. Hence any one who wishes to acquire a thorough knowledge of anatomy must prepare a dead body, and carefully examine all its parts. For it is only by combining both direct ocular observation and the information of text-books that thorough knowledge is obtained. For this purpose one should select a body which is complete in all its parts. It should also be the body of a person who was not excessively old, nor who died

of poison or of a protracted disease Having removed all excrementitious matter from the entrails, the body should be wrapped in rush, or bast, or grass, or hemp, and placed in a cage Having firmly secured the latter, in a hidden spot, in a river with no strong current, the body should be allowed to decompose After an interval of seven days the thoroughly decomposed body should be taken out, and very slowly scrubbed with a whisk made of grass-roots, or hair, or bamboo, or bast At the same time, every part of the body, great or small, external and internal, beginning with the skin, should be examined with the eye, one after the other, as it becomes disclosed in the course of the process of scrubbing' (Original Text in § 95¹)

3 The procedure, thus described, will doubtlessly enable the observer to recognize such structures as the clusters (*khūca*) of small bones which make up the carpus and tarsus But it would hardly suffice to enable him to discover bones lying interiorly, such, for example, as the ethmoid, sphenoid, vomer, and others in the interior of the head As a matter of fact, we do not find these latter bones mentioned even in the more accurate list of Suśruta

§ 46 *Conspectus of the Ancient Indian and Modern Systems*

1 The subjoined comparative table, setting side by side the system of Modern Anatomy and the systems of Ātreya-Charaka and Suśruta, as well as the skeleton shown in Figs 4 and 5, may serve as a guide to the detailed identification of bones discussed in the succeeding paragraphs Column I on Modern Anatomy is based on Dr Samuel O L Potter's *Compend of Human Anatomy* (5th ed, 1893), pp 9, 10, column II on §§ 4, 7, and column III on § 34

¹ A German translation is given in Professor Jolly's *Indian Medicine*, pp 44, 45, in the *Cyclopedia of Indo-Aryan Research* See also Dr Wise's *Hindu System of Medicine* (new issue), pp 68, 69

I Potter	II Charaka	III Suśruta	
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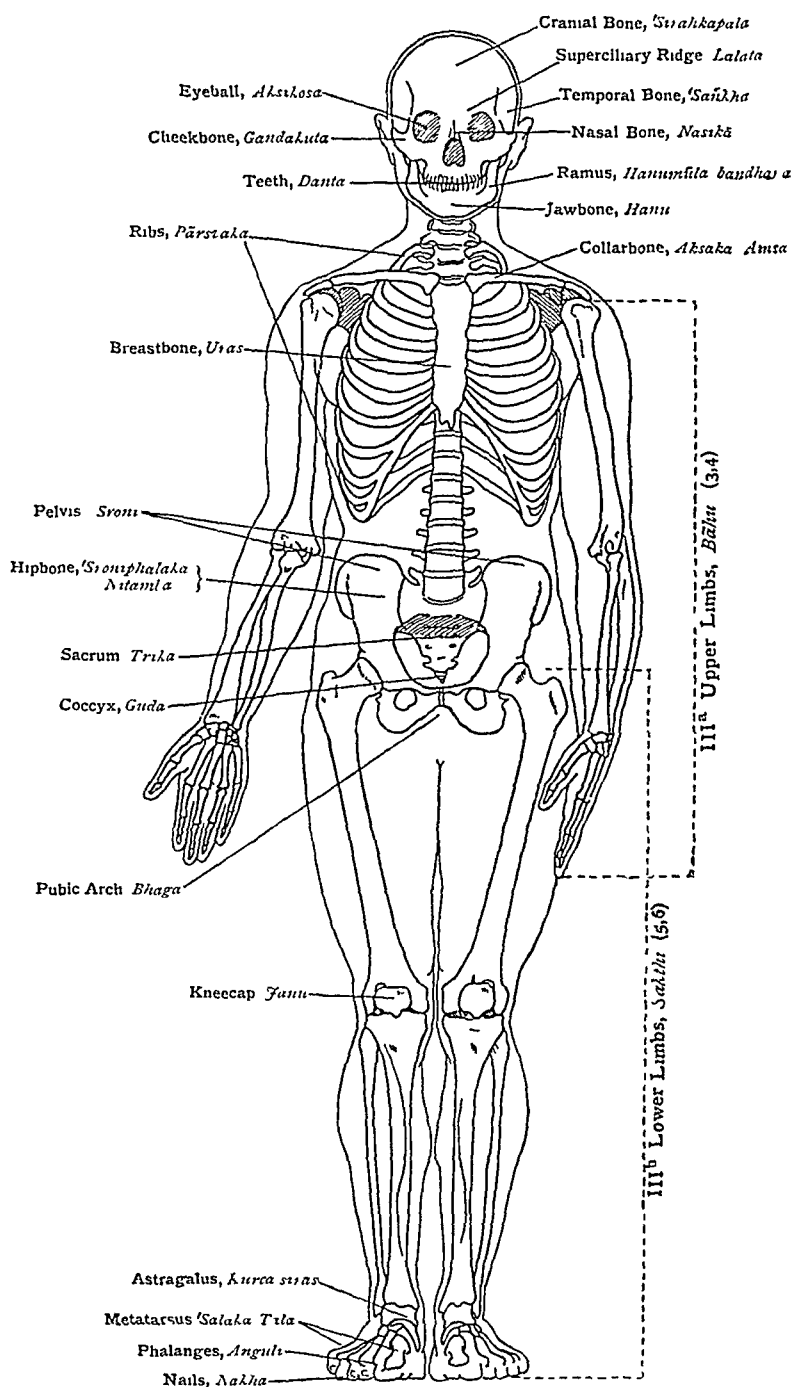
A Four Extremities

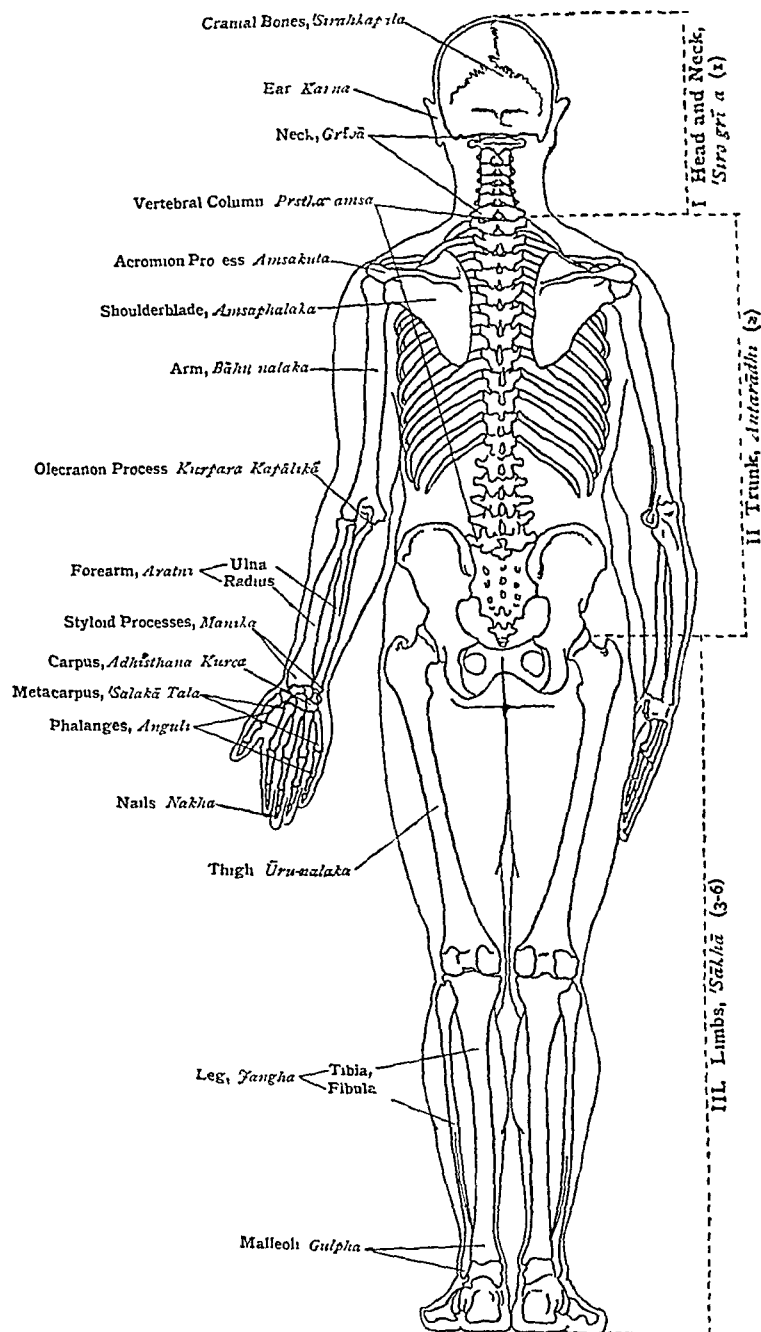
1 Phalanges, of joints of fingers and toes	56	pāni-pād- āṅgulī 60	pāni-pād- āṅgulī 60	§ 47
2 Metacarpus and Metatarsus, Long bones	20	salākā 20	tala 20	§ 48
3 Carpus and tarsus, Clusters, or Bases	30	adhsthāna 4	kūica 4	§ 49
4 Os calcis, heel		pārsni 2	pārsni 2	§ 50
5 Forearm (Radius, Ulna)	4	aiatni 4	aiatni 4	§ 51
6 Styloid processes, wrist-bones		manika 4	manibandha 2	§ 52
7 Olecranon, elbow-pan		kapālikā 2	kūrpaia 2	§ 53
8 Leg (tibia and fibula)	4	jangha 4	jangha 4	§ 51
9 Malleoli, ankle-bones		gulpha 4	gulpha 2	§ 52
10 Patella, knee-cap	2	jānu 2	jānu 2	§ 53
11 Arm (humerus)	2	bāhu-nalaka 2	bāhu 2	§ 54
12 Thigh (femur)	2	ūru-nalaka 2	ūru 2	§ 54
	120	110	106	

B Trunk

Shoulder				
13 Clavicle, collar-bone	2	aksaka 2	aksaka 2	§ 55
14 Scapula, shoulder-blade	2	amsa-phalaka 2	amsa-ja 2	§ 56
15 Thorax Ribs	24	pārsvaka, &c 72	pārsvaka, &c 72	§ 58
16 Sternum, breast-bone	1	uas 14	uas 17	§ 57
17 Vertebrae, thoracic and lumbar	17	} prstha 45	prstha 30	§ 59
18 Pelvis Sacrum	1		trika 1	§ 60
19 Coccyx	1		guda 1	§ 60
20 Ilum, ischium	} 2	sioni-phalaka 2	nitamba 2	§ 60
21 Pubes		bhag-āsthī 1	bhaga 1	§ 60
	50	138	128	

I Potter		II Charaka		III Susruta		
C Head and Neck						
22	Cervix					
	Vertebrae, Neck bones	7	gīṇā	15	gīṇā	9 § 61
23	Trachea, wind- pipe		jatiu	1	kantha-nāḍī	4 § 62
24	Cranium, Frontal	1	śīrah-kapāla	4	śīrah kapāla	6 § 63
	Parietal	2				
	Occipital	1				
	Sphenoid	1				
	Ethmoid	1				
25	Temporal	2	sankhaka	2	śankha	2 § 64
26	Face					
	Superior	2	hanu hanumūla	3	hanu	2 § 65
	Maxillary					
	Inferior do	1				
	Superciliary ridges, brows		lalāta	1	ganda	2 § 66
27	Malar	2	ganda kūta			
28	Nasal	2	nāsikā		nāsā	3 § 66
29	Palate bones	2	tālūsika	2	tālu	2 § 67
	Lachrymal	2				
	Inferior tur- binated	2				
	Vomer	1				
	Hyoid	1				
30	Additional					
	Teeth		danta	32	danta	32 § 68
	Sockets of teeth		ulūkhala	32		§ 68
	Nails		nakha	20		§ 69
	Eyeballs				akṣi kosa	2 § 70
	Ears				kaṇa	2 § 71
	Total	30		112		66
	Grand total	200		360		300

FIG 4 HUMAN SKELETON *Asth-samgraha* Front View

FIG 5 HUMAN SKELETON *Asthī-saṁgrāha* Back View

A THE FOUR EXTREMITIES

§ 47 *The Phalanges*

Pāṇi-pād-āṅguḷi, or phalanges of the hands and feet Both Atieya-Chaiaka and Suśruta count sixty of these phalanges,

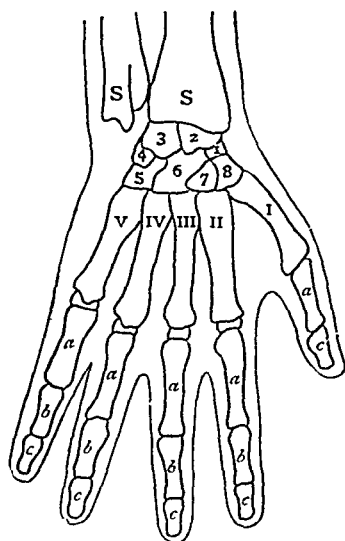


FIG 6

OUTLINES OF THE HAND

- 1-8 Carpus, *Kūṇ ca*
 1 Scaphoid } *Kūṇ ca-sṇ as*
 2 Semilunar }
 3 Cuneiform
 4 Pisiform
 5 Unciform
 6 Os magnum
 7 Trapezoid
 8 Trapezium
 I-V Metacarpus, *Śalākā*
 a-c Phalanges, *Anguḷi*
 S S Styloid Processes, *Mamka*

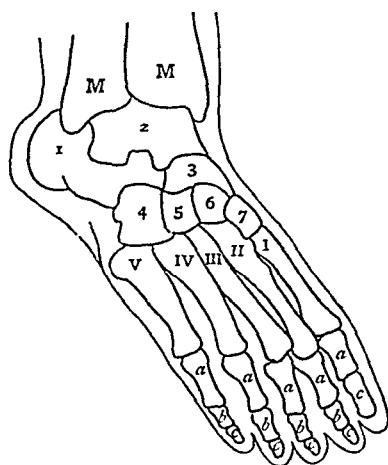


FIG 7

OUTLINES OF THE FOOT

- 1-7 Tarsus, *Kūṇ ca*
 1 Os calcis, *Pāṇi sṇi*
 2 Astragalus, *Kūṇ ca-sṇ as*
 3 Navicular
 4 Cuboid
 5 External cuneiform
 6 Middle "
 7 Internal "
 I-V Metatarsus, *Śalākā*
 a-c Phalanges, *Anguḷi*
 M M Malleoli, *Gulpha*

giving three to each finger and toe The actual number is only fifty-six, there being in reality only two phalanges in the thumb and great toe Professor Pancoast, however, counts fifteen

phalanges in either hand, classing the first metacarpal bone among the phalanges of the thumb,¹ and thus making the total of the phalanges to be fifty-eight. He would seem to consider the trapezium (Fig 6), one of the carpal bones with which the first metacarpal articulates, to be the real metacarpal of the thumb, and the real homologue of the metacarpals of the other four fingers. According to the usual view the clusters of carpal and tarsal bones contain eight and seven bones respectively. Professor Pancoast's theory would equalize these numbers by the exclusion of the trapezium. It is interesting to observe that Chakrapāṇidatta's somewhat obscure remarks on the phalanges seem to indicate his having held a similar view. For he says (§ 11) 'As to the third joint of the thumb and great toe, it must be understood to be contained within the respective hand or foot,' that is, within the palm or sole or, in other words, among the metacarpal or metatarsal bones. And he adds 'The long bones belonging to the thumb and great toe are also of small size', that is, he appears to have identified the trapezium as the first metacarpal, and the internal cuneiform bone of the tarsus (Fig 7) as the first metatarsal. How far the explanation of Chakrapāṇidatta may be the survival of an ancient tradition going back to the time of Atreya and Suśruta, it is, at present, impossible to say. But on the whole it seems more probable that the reckoning of sixty phalanges by the ancient Indian anatomists is based on fancied claims of symmetry (§ 44).

§ 48 *The Long Bones*

1 *Pāṇi-pāda-sālākā*, or the long bones of the hands and feet. These are the metacarpal and metatarsal bones. Charaka counts twenty of them, five in either hand and foot (§ 4), which agrees with the actual number. Suśruta, in his list (§ 27), aggregates them under the term *tala*, which signifies the palmar and plantar portion of the hand and foot respectively. The Atharva Veda (§ 43) denotes that portion by the term *uchlakha*.

2 It may here be useful to note that the combined term *tala-kūṇca-gulpha*, sole-cluster-ankle, employed by Suśruta in his

¹ Dr Potter's *Compend of Human Anatomy*, pp 49, 50

list (§ 88) denotes the whole (roughly rectangular) portion of the foot and hand, as shown in Figs 6 and 7, exclusive of the phalanges. That is to say, it signifies the metatarsus (*tala*), tarsus (*kūrca*), and malleoli (*gūlpha*) of the foot, and similarly the metacarpus (*tala*), carpus (*kūrca*), and styloid processes (*manibandha*) of the hand.

§ 49 Bases or Clusters

1 *Pāṇi-pāda-salāk-ādhisthāna*, base (prop) of the long bones of the hand and foot, or simply *sthāna* or *matisthā*, base, or *kūrca*, cluster (of bones). The first-mentioned term occurs in the lists of Charaka (§ 4) and Bheda (§ 12), the second and third in the lists (non-medical) of Yājñavalkya (§ 16) and the Atharva Veda (§ 43) respectively, the fourth in the list of Suśruta. See Figs 6 and 7.

2 Ātreyā, whose system is reported by Charaka and Bheda, appears to have held the opinion that the long bones (metacarpals and metatarsals) were fixed in one bone as their common base. He may have known that this base (the carpus, or tarsus) was really composed of a cluster of small bones, but the term *adhisthāna* (or *sthāna*) which he chose as its name, rather suggests that he thought it to be a single undivided bone. Actual examination of a prepared skeleton, such as Suśruta certainly practised (§ 45), would, of course, have set him right, but it may be doubted whether he ever went beyond a superficial examination of a dead body.

3 Suśruta's use of the term *kūrca*, cluster, which he substitutes for *adhisthāna*, base, is by itself sufficient to show that he was aware of the true nature of the 'base', as being made up of a cluster of small bones. It is not improbable that he knew even the exact number of the small bones which constitute each cluster (eight in the carpus and seven in the tarsus), but, so far as I know, there is no passage in his Compendium which definitely proves it. Rather inconsistently, but probably in deference to the older view, he continued, for the purpose of his list, to count his 'cluster' as one bone. But of course, properly

interpreted, this only means that he counted the 'cluster' as a composite bone, or rather as a set of bones

4 The identity of the organ which Suśruta calls *kūca*, cluster, may also be inferred from a passage in which he describes its position in the limb. In the sixth chapter of the Anatomical Section (*Śāstrīya Sthāna*), explaining his doctrine of the 'vital spots' (*marman*), he says

'Between the great toe and the toe next to it, there lies the vital spot called *ksipa*. Upwards of this *ksipa*, both ways (i.e. exteriorly and interiorly), there lies the vital spot called *kūca*' (Original Text in § 97, cl. 1)

Referring to Fig. 7, it will be seen that Suśruta's *kūca*, or cluster (of bones), lies on the exterior and interior sides of the foot, beyond the great and second toes. As a matter of fact, the seven bones of the tarsal cluster are in modern Anatomy considered as 'placed in two rows, side by side, two bones in the external row, five in the internal, as follows: externally, os calcis (No. 1), and cuboid (No. 4); internally, astragalus (No. 2), scaphoid or navicular (No. 3), and the three cuneiform (Nos. 5, 6, 7).¹ *Mutatis mutandis* these remarks apply also to the carpal cluster. The eight bones of that cluster are now usually considered as 'placed in two rows, one in front of the other, with four bones in each row'.¹ But they may also be considered as placed (Fig. 6) in two rows, side by side, four bones externally (Nos. 3, 4, 5, 6, unciform, pisiform, cuneiform, os magnum), and four internally (Nos. 1, 2, 7, 8, scaphoid, semilunar, trapezoid, trapezium).

5 The only difficulty about Suśruta's *kūca*, or cluster, arises from the fact that the Traditional Recension of his statement on the skeleton (§ 27) ascribes to him, by implication, the doctrine that there are eight *kūca*, or clusters, in the four extremities, two in either hand and two in either foot. It has been shown, however, in § 31, that this is a complete error, foisted into the system of Suśruta, in all probability, from the system of Vāgbhata I (§ 37, also pp. 99, 103). The true doctrine of Suśruta, stated by himself in explicit terms (§ 31),

¹ See Dr. Potter's *Compend of Human Anatomy*, pp. 48 and 53

knows only four *kūca*, or clusters, one in either hand, i.e. the carpus, and one in either foot, i.e. the tarsus

6 It might be thought that Vāgbhata I derived his doctrine that there are eight *kūca*, two in either hand and two in either foot, from the circumstance, above referred to, that the small bones of the carpi and tarsi are placed in two rows. One would thus obtain eight rows of small bones, two in either hand and two in either foot, and it might be thought that Vāgbhata I wanted to express that circumstance by his count of eight *kūca*, or rows. In support of this view it might be said that Vāgbhata I also counts four *gūpha*, or ankle-bones, as well as four *manibandha*, or wrist-bones (§ 37). Seeing that there are actually two malleoli (or ankle-bones) in either leg, and two styloid processes (or wrist-bones) in either forearm, it seems a very plausible conclusion that Vāgbhata I was really thinking of the four malleoli and four styloid processes when in his list of bones he enumerates four *gūpha* and four *manibandha*, and similarly that he was thinking of the eight rows of small bones in the two carpi and tarsi, when he counted eight *kūca*. But such a view would credit Vāgbhata I with more consistency and more accurate knowledge of anatomy than he really possessed. How little of both qualities his statement on the skeleton exhibits has been already shown in § 38. A striking proof of his imperfect knowledge of the skeleton is the circumstance that in his list (§ 37) he enumerates both *adhīsthāna* and *kūca* as two distinct kinds of bone. By the former he understood the carpus and tarsus. This is clear from the term *pratibandhaka*, or interlocker, by which he calls them. He says 'There are five long bones, and one bone interlocking them' (Original Text in § 93). This shows that (whatever Ātreya-Charaka's view of the real nature of *adhīsthāna* may have been) Vāgbhata I took it to be a single undivided bone, on which the five long bones articulated. But as he had thus provided for the carpus and tarsus, it is difficult to understand what he could have imagined the additional *kūca* to be. Seeing that all actually existing bones (Figs 6 and 7), phalanges, metacarpus (or metatarsus), carpus (or tarsus), and styloid processes (or malleoli) were already covered by the terms *anguli*, *śalākā*,

pratibandhaka (or *adhīsthāna*), and *manibandha* (or *gūḍhā*), there was no bone left to be named *kūca*. It may be doubted whether Vāgbhata I had any idea as to what the Suśrūta term *kūca* meant. He certainly failed to see that it signified the equivalent of the Charakian term *adhīsthāna*, and his anatomical knowledge was too imperfect to prevent that failure. It thus came to pass that, dominated by his desire of combining the two systems of Suśrūta and Charaka, he not only superfluously counted the *kūca*, by the side of his *pratibandhaka* (Charaka's *adhīsthāna*) but actually duplicated its numbers, counting eight *kūca* instead of four.

7 In connexion with the cluster of bones (*kūca*) it may be well to discuss the case of a bone which is not especially enumerated in the list of Suśrūta, but which he mentions in the sixth chapter of his Anatomical Section (*Śāṣṭha Sthāna*), in discussing the 'vital spots' (*maṇḍan*). It is there named by him *kūca-śiras*, or head of the cluster, that is, head-bone within the cluster. He defines its position as follows

'Below the ankle-joint, but not on both sides, there lies what is called the head of the cluster' (Original Text in § 97, cl 1)

By referring to Fig 7, it will be seen at once that the bone here described as the head of the cluster is the astragalus (No 2). It forms the lower part of the ankle-joint, and lies below the distal ends of the tibia and fibula with both of which it articulates. In the list of Suśrūta (§ 27) it is not specially enumerated, because, of course, it is included in the cluster (*kūca*) of which it merely forms the head-bone. But in his chapter on the 'vital spots' it had to be mentioned separately by the side of the cluster, on account of its being the location of a particularly dangerous spot, in addition to another dangerous spot located in the remainder of the cluster (Nos 3, 4, 5, 6). The astragalus (No 2) and the os calcis (No 1) are the two largest bones of the tarsal cluster, and Suśrūta distinguishes them by the names 'head of the cluster' (*kūca-śiras*) and 'heel' (*pāṇi*) respectively. That fact definitely proves that he was aware of the real nature of the tarsus as being composed of a cluster (*kūca*) of bones. Atreya-Charaka, on the other hand,

knew nothing of a head of the cluster, and his heel (*pāśm*), as we shall see in the next paragraph, is merely the projecting tuberosity of the os calcis. With him both the astragalus and the os calcis are included in his *adhīsthāna*, or base, and there is nothing to prove definitely that he knew anything of the real composite nature of the organ which he called *adhīsthāna*.

8 It should be mentioned that Suśruta teaches the existence of four *kūca-snas*, or heads of clusters. He says

‘There are two ankles, two wrists, and two pairs of cluster-heads. These eight an experienced surgeon should know to be vital spots that are apt to cause diseases’ (Original Text in § 96, cl 6.)

What Suśruta means is, of course, that there is a head-bone in each of the four clusters (*kūca*), that is, in either of the two carpi and tarsi. The head-bones of the two tarsi are then respective astragali. Those of the two carpi would appear to be then respective semilunar bones (No 2 in Fig 6). Charaka (i.e. Ātīya), as has been already indicated, does not mention the existence of any of these four head-bones.

§ 50 *The Heel*

Pāśm, or the heel. See Fig 7. This term, as used by Charaka, denotes the backward and downward projection of the os calcis, that is, that portion of it which can be superficially seen and felt, and is popularly known as the heel. Accordingly, in Ātīya’s statement of the skeleton, as reported by Charaka and Bheda (§§ 4, 12), the number of heels is rightly said to be two. In the list of Vāgbhata I (§ 37), rather grotesquely a heel is ascribed to each of the four extremities, two in the feet and two in the hands, giving a total of four heels. The reason of this incongruous conception has been explained in § 32. It arose from a false construction of Suśruta’s direction regarding the method of counting the bones of the four extremities, and it actually succeeded, probably on the authority of Vāgbhata I himself, in being received into the Traditional Recension of Suśruta’s statement on the skeleton (§ 27). There can hardly be any doubt that the statement of Suśruta, in its original and

genuine form, taught no more than two heels. From the general tenor of it, it is evident that Suśruta knew the true nature of the tarsus, namely, that it is a cluster (*kūṇca*) of small bones. The two largest of these small bones he distinguished by special names, namely, the astralagus (No 2) by *kūrca-sṛas*, or head of the cluster (§ 49), and the os calcis (No 2), by *pārsni*, or heel. In his detailed list of the bones (§ 27) he did not enumerate the 'head of the cluster' separately, for of course it was implicitly included in the term 'cluster' (*kūṇca*). But the heel (*pārsni*) he counted separately, either as a concession to the older system of Ātreya, and to popular usage, or, perhaps on the whole more probably, because he did not consider the os calcis as constituting one of the component bones of the cluster (*kūṇca*). In all probability Suśruta's real view of the lower portion of the lower extremity (the portion shown in Fig 7) was that it was formed by five constituents: 1, phalanges (*angulī*), 2, metatarsals (*tala* or *śalākā*), 3, tarsal cluster (*kūṇca*) of six small bones (Nos 2-7), 4, ankles (*gūlpha*), and 5, os calcis or heel-bone (*pārsni*, No 1). The view of Ātreya-Charaka differed from the view of Suśruta only in considering the tarsus to consist, not of a cluster of bones, but of a single, undivided supporting bone (*adhsthāna*), which included the body of the os calcis, but excluded its posterior downward projection, the latter being counted separately and named *pārsni*. In § 65 it will be shown that there exists a similar difference of opinion with respect to the term *hanu* between Suśruta and Ātreya-Charaka. The former uses it as denoting the whole lower jaw-bone (inferior maxillary), while with Ātreya it denotes its (roughly) triangular 'mental protuberance,' popularly known as the chin (Fig 31).

§ 51 Forearm and Leg

Aratni or *prabāhu*, forearm, and *jangha*, leg. The term *prabāhu* occurs only in certain manuscripts of the Vishnu Smṛiti (see § 84). In all the three statements, of Ātreya (that is, Charaka and Bheda, §§ 4, 12), Suśruta (§ 27), and Vāgbhata I, (§ 37) these two organs are correctly described as consisting of two bones each—viz the radius and ulna in the forearm, and

the tibia and fibula in the leg. In the Atharva Veda (verse 3 in § 43) the figure made by the two bones of the leg is appropriately described as 'a four-sided frame having its ends firmly knit together', and this description of course is intended also to apply to the bones of the forearm. See Figs 8 and 9

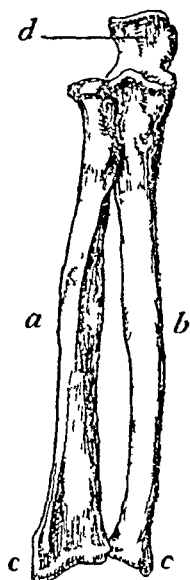


FIG 8

FOREARM, *Aratni*

- a Radius
- b Ulna
- c, c Styloid processes, *Manika*
- d Olecranon process, *Kapālikā*

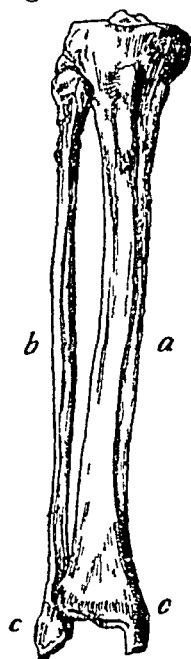


FIG 9

LEG, *Jangha*

- a Tibia
- b Fibula
- c, c Malleoli, *Gulpha*

§ 52. Ankles and Wrists

Manika or *manibandha*, wrist-bone, and *gulpha*, ankle-bone. See Figs 6 and 7. In literary Sanskrit these terms denote the wrist-joint and ankle-joint respectively, but as anatomical terms they signify more precisely the wrist-bones and ankle-bones, that is, the distal processes of the two bones of the forearm and leg which are known respectively as the styloid processes and the

malleoli By the ancient Indian anatomists, according to their peculiar method (§ 44, cl 3), they are reckoned as separate bones, but while Ātreya counts them all singly, and thus in the list, reported by Charaka (§ 7), enumerates four wrist-bones and four ankle-bones, Suśruta counts them by pairs, and thus in his list (§ 34), has only two wrist-bones and two ankle-bones, one in each forearm, and one in each leg The Traditional Recension, of the list of Charaka (§ 4), it is true, counts only two wrist-bones, but it has been shown in §§ 6 and 25 (p 67) that the original and genuine list (§ 7) must have contained four wrist-bones On the other hand, the Traditional Recension of Suśruta's list (§ 27) gives four wrist-bones and four ankle-bones This, as shown in §§ 31, 41, is also an error, due to the influence of Vāgbhata I (§ 37), who, in pursuance of his aim of combining and harmonizing the two systems of Charaka and Suśruta, adopted Charaka's way of counting the wrist-bones and ankle-bones.

2 The truth regarding the way in which Suśruta contemplated the styloid processes and malleoli is clearly brought out by the term *valaya*, wristlet or anklet, which he applies to them (§ 30) It is obvious from this comparison that he looked upon each pair of styloid processes and malleoli as forming but a single composite bone encircling the lower part of the forearm, or leg, like a wristlet, or anklet (see Fig 2, p 80) It must be admitted that this is a rather fanciful way of treating those organs At the same time, it is quite consistent with Suśruta's methods, he treats the carpus and tarsus in exactly the same way. For him both are single, composite bones, or clusters (*lūrca*) as he calls them (§ 49) For the purpose of enumeration in the list of bones, the clusters, though consisting of a number of small bones, are reckoned each as a single bone, or—it would be better to say—as a single system of bones Similarly, the pairs of styloid processes and malleoli are counted, in the list, each as a single bone, or rather as a single system of bones

§ 53 *Elbow-pan and Knee-cap*

1 *Kapālīkā* or *lūrpara*, elbow-pan, and *jānu* or *jānuka*, knee-cap. There can be no doubt regarding the bones to which these terms

1efei They are the olecranon process of the elbow, and the patella of the knee. The former, which 'in its function and structure resembles the patella',¹ is not a separate bone, but a process of the ulna (Fig. 8). But by the ancient Indian anatomists, according to their usual practice (§ 44), it is counted as a separate bone. They follow herein our own popular usage which speaks of it as the 'funny bone' or 'crazy bone'.

2 The term *kūpara* is peculiar to Suśruta, who expressly defines it as denoting the homologue of *jānu*, the knee-cap (p. 72), and who may, therefore, have been the first to use it as a denotation of the olecranon process. The term *kapālikā* is peculiar to Ātreya (Charaka and Bheda). It means, literally, a small shallow dish, and is therefore identical in meaning with patella, the Latin

name of the knee-cap. It well describes the appearance of the olecranon process, which presents, in the ventral view, a concave surface, the so-called great sigmoid cavity (Fig. 8). Accordingly, in this treatise, it has been rendered by 'elbow-pan'.

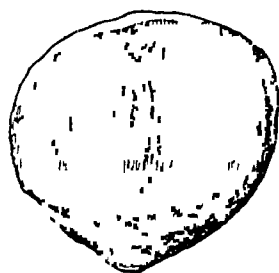


FIG. 10

THE PATELLA, *Jānu*
From the back, showing
interior concave surface

3 The term *kapola*, for the elbow-pan, which is found in the Non-medical Version (§ 16), is undoubtedly, as has been explained in § 19, cl. 4, an ancient misreading for *kapāla*, pan, of which *kapālikā* is a diminutive. By

way of corroboration it may be mentioned that the Smaller Petersburg Dictionary quotes the form *kapolaka* as a misreading for *kapālaka*, pan. The antiquity of the misreading may be seen from the fact that ancient Sanskrit dictionaries mention *kapolī*, with the meaning knee-cap. The true form, of course, is *kapālī*, a feminine diminutive of *kapāla*, meaning a small pan, or any small pan-like bone, such as the knee-cap or elbow-pan. Similarly, *kapāla* itself is used to denote the larger pan-shaped bones of the cranium (§ 63).

4 The Atharva Vedic list (§ 43) has the two synonymous

¹ Dr. Potter's *Compend of Human Anatomy*, p. 47

terms *jānu* and *asthīvāt*. The latter literally means 'the organ (knee) which possesses a bone (patella)', and thus, like *jānu*, comes to denote specifically the knee-cap.

§ 54. Arms and Thighs

Bāhu, arm, and *ūru*, thigh. These two terms are employed by Suśruta (§ 27) and Vāgbhata I (§ 37). Charaka uses the fuller terms *bāhu-nalaka*, reed-like or hollow bone of the arm, and *ūru-nalaka*, reed-like, or hollow bone of the thigh (§ 4). All three correctly ascribe to either organ a cylindrical bone, the humerus and the femur respectively, with a hollow shaft, the so-called medullary cavity. See Figs. 4 and 5.

B THE TRUNK

§ 55. The Clavicle or Collar-bone

1 *Aksaka* or *akṣa*, also *amsa* or *amsaka*, clavicle or collar-bone (Fig. 11). All three writers, Ātreya-Charaka, Suśruta, and Vāgbhata I, in their lists (§§ 4, 27, 37), correctly state the number of these bones to be two.



FIG. 11

THE RIGHT CLAVICLE, *Aksaka*

- a Shaft
- b Sternal end
- c Acromial end

2 The first-named term, *aksaka*, is the strictly technical denotation of the collar-bone. It is uniformly explained by the commentators to have that meaning. Thus Dallana, in his commentary on the thirty-fourth and forty-eighth verses of the third chapter of the Therapeutical Section (*Cikitsā Sthāna*) of the Compendium of Suśruta, explains it by saying 'The *aksaka* is located above the shoulder-joint,' and again, 'The *aksaka*

is the part above the shoulder-joint' (Original Texts in § 97, cl 2) Similarly Gangādhar, in his commentary on Charaka's skeletal statement, says 'The two *aksaka* are the two shoulder-bones (*amsaka*) which lie below the throat' (Original Text in § 97, cl 2) But the matter is clinched by Chakiapānidatta, who (§ 11, p. 36) very aptly likens the two *aksaka* to two *kīlaka* or 'pegs that run athwart the anterior part of the trunk' Referring to Figures 4 and 12, it will be seen that the external end of the

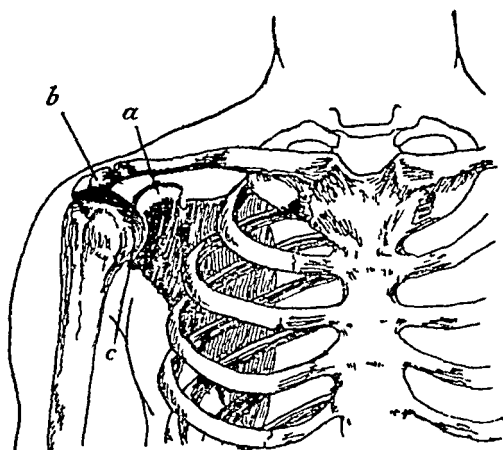


FIG 12

DIAGRAM OF RIGHT HALF OF SHOULDER-GIRDLE

Ventral view showing—Clavicle, *Aksaka*, above
 Scapula, *Amsa-phalaka*, below (shaded)
 with *a* Coracoid process
b Acromion process, *Amsa-līla*
c Glenoid cavity, *Amsa-pītha*

clavicle lies exactly above the shoulder-joint, and its internal end below the throat, while the whole clavicle runs, like a peg, across from the throat to the shoulder-joint

3 In the shorter form *akṣa*, the term occurs only in the Non-medical Version of the system of Ātīeya (§ 16),¹ where, however, as stated in § 20, cl 4, it is wrongly explained by the

¹ It also occurs in the *Satapatha Brāhmaṇa* see Monier Williams's Dictionary, 2nd ed

commentators of the Law-book of Yājñavalkya to signify 'a bone on the edge of the eye', or, 'a bone between the eye and the ear'. And this unintelligent guess at the meaning of *akṣa* was copied from them by Nanda Pandita, in his Commentary on the Institutes of Viṣṇu, where he says that the term means 'the part below the temples, between the ear and the eye'¹. In medical works the term never occurs with that meaning. The only other way in which I have noticed it used in a medical work is as a synonym of *indriya*, or organ of sense. With this meaning it occurs not unfrequently in the Compendium of Vāgbhata II (e.g. *Sūtra Sthāna*, chap I, verse 33, X 2, XII 17, *Śārirā Sthāna*, III 5), where the commentator expressly says that 'the organs of sense are called *akṣa*' (*akṣāni indriyāni ucyante*). It may be noted, however, that Vāgbhata I, in his Summary, in the corresponding passages never uses the term *akṣa*, but always *indriya* (*Sūtra Sthāna*, chap XIX, vol I, p 96, l 21, XIX, p 106, l. 16, *Śārirā Sthāna*, chap V, p 220, l 8)².

4 As to *amsa*, it is properly an indefinite term, denoting the shoulder-girdle generally. But in the Compendium of Suśruta it is frequently used as a synonym of *akṣaka* to denote the collar-bone, as distinguished from *amsa-phalaka*, which denotes the shoulder-blade or scapula. This usage is explicitly explained in a passage in the sixth chapter of the Anatomical Section (*Śārirā Sthāna*), where Suśruta defines the names and positions of those two parts of the shoulder-girdle. He says

'In the upper part of the back, and on both sides of the vertebral column, there lie what are called the shoulder-blades (*amsa-phalaka*), being of triangular form (*triṅga-sambaddha*). Be-

¹ Curiously enough, in the exact position indicated by Nanda Pandita, there is a small elongated bone, called the Zygomatic Process (see Figs 211, 239, on pp 184, 204, of Dr Gerishi's *Textbook of Anatomy*, 2nd ed., 1903). But, even granting the improbable assumption that this process was known to the legal commentators, the explanation is out of place, because *akṣa* is enumerated, not among the bones of the head, but among those of the trunk.

² It is this meaning of *akṣa*, which appears to have suggested to Aparārka the interpretation of *akṣa-tātū-aka*, as 'edge of the eye', see p 55, footnote 1.

tween the head of the arms and the neck there lie what are called the collar-bones (*amsa*), connecting the shoulder-seat (*amsa-pīṭha*, i.e. the glenoid cavity)¹ with the nape of the neck. (Original Text in § 97, cl 3)

In another passage in the same sixth chapter, in which Suśruta describes the forty-four 'vital spots which cause weakness' (*vaikalya-karāṇi marmāṇi*), he enumerates (Original Text in § 97, cl 4) among their number the two *amsa* or collar-bones, and the two *amsa-phalaka* or shoulder-blades. Exceptionally, it would seem that Suśruta employed the term *amsa* also to denote the shoulder-blade. Thus in the passage, quoted in § 30, in which he divides the bones of the skeleton in five classes, according to their shapes, he places the bones which he there calls *amsa* among the pan-shaped ones. It is obvious from this very classification that by the term *amsa* Suśruta can there mean no other than the shoulder-blades, for these, as a fact, are pan-shaped, broad, and flat bones, while the collar-bones are short, cylindrical bones which belong to the class described by Suśruta as *nalaka*, or reed-like. In another passage of the fifth chapter, in which Suśruta enumerates the muscles (*peśi*) of the body, he says that 'there are seven muscles round about the collar-bone (*aḥsaka*) and shoulder-blade (*amsa*, Original Text in § 97, cl 4)'. Here again it is obvious that by the term *amsa* Suśruta cannot mean the collar-bones, which are already indicated by the term *aḥsaka*. The term *amsa*, therefore, can only refer to the shoulder-blades. It is possible that Suśruta might have used the term *amsa*, which in the ordinary Sanskrit is only a general name for the shoulder, indifferently to denote sometimes the collar-bones, and at other times the shoulder-blades. But such a practice is obviously very inconvenient, and it is not at all probable that Suśruta was guilty of it. It is far more probable that the traditional text of the passages in which Suśruta is made to use the term *amsa* to denote the shoulder-blades is corrupt, and that in every such case, instead of *amsa* we should read *amsa-ja*,

¹ This is not quite correct. The clavicle does not connect with the glenoid cavity (*amsa-pīṭha*), but with the acromion process (*amsa-kūṭa*). Possibly the traditional reading of Suśruta's text is at fault.

'sprung from the shoulder' The latter term quite properly describes the shoulder-blades as springing from the shoulder (Fig 12) It has already been explained in § 29 that the term *saṃjñā*, 'so-called,' which is so unaccountably found in the Traditional Recension of Suśruta's list of the skeletal bones, suggests itself to be a corruption of the term *amsaja*, caused by copyists unfamiliar with skeletal anatomy and its terms It may be suggested that probably in the two passages above referred to we should also read *amsaja* instead of *amsa*¹ It would thus appear that Suśruta employs the following pairs of terms (1) *akṣaka* and *amsa*, to denote the collar-bones, (2) *amsaphalaka* and *amsa-ja*, to denote the shoulder-blades, the last-mentioned term *amsa-ja* being misunderstood by copyists and changed either into *saṃjñā* or simply into *amsa*

5 In this connexion it may be useful to identify two other terms occasionally used by Suśruta, namely *amsa-kūta* and *amsa-pīṭha* The former occurs in a passage of the sixth chapter of the Anatomical Section (*Śāṛīra Sthāna*), in which Suśruta describes two 'vital spots' (*marman*) of the body (see the Original Text in § 97, cl. 5), called by him *apalāpa* (apparently the upper attachment of the coraco-biachialis muscle see Figs 295, 303, 304, in Dr Grunish's *Textbook of Anatomy*, 2nd ed., pp 274 and 277) These two vital spots (one, of course, on either side of the body) he says are situated 'below the two summits of the shoulder' (*amsa-kūta*) The 'two summits of the shoulder' (Fig 22), are the two acromion processes of the right and left scapula, below which the coraco-biachialis attachment is situated The *amsa-pīṭha*, lit shoulder-seat, is mentioned in a passage in the fifth chapter of the Anatomical Section (Original Text on § 97, cl 6), in which Suśruta describes eight kinds of differently shaped joints² These two joints are described as being *sāṃudga*, that is shaped like a round casket (*samudga*)

¹ It may be useful to collect the passages in question They are (1) in the Number-list (§ 29), for *akṣaka-saṃjñā* read *akṣak-āmsaje*, (2) in the Class-list (§ 30), for *amsa* read *amsaja*, (3) in the list of muscles, for *akṣak-āmsau* read *akṣak-āmsajau*

² Another mention occurs in the passage on *amsa*, quoted earlier in this paragraph

These are the shoulder-joint and the hip-joint. The former is called *amsa-pīṭha*, or shoulder-seat, and indicates the glenoid cavity, into which the head of the humerus is inserted (Fig 13). The latter is described as being formed of the anal bone (*guda*, coccyx), pubic bone (*bhaga*, pubic arch), and hip-bone (*nitamba*, ilium and ischium), and indicates the acetabulum or cotyloid cavity, in which the head of the femur is lodged¹ (Fig 20).

6 The longer form *amsaka* occurs, e g in the passage above quoted from the Commentary of Gangādhar. It is a derivative of *amsa*, shoulder, and means shoulder-bone, that is, collar-bone. A similar formation is that of *śaṅkhaka*, temporal bone, from *śaṅkha*, temple (§ 64), and *pāśīśaka*, rib, from *pāśīśva*, side (§ 57).

§ 56 *The Shoulder-blade or Scapula*

1 *Amsa-phalaka*, flat bone of the shoulder, *amsa-ja* or *amsa-samudbhava*, (bone) springing from the shoulder. All three terms are employed to denote the shoulder-blade or scapula, but the first-named, *amsa-phalaka*, is the term which is commonly used by Ātreya-Charaka, Suśruta, and Vāgbhata I. The term *amsa-ja* is conjectural and only occurs in the Compendium of Suśruta (§§ 29, 55). The term *amsa-samudbhava* is found only in the Non-medical Version of Ātreya's statement on the skeleton, and is probably a synonymous variation of the Suśrutīyan term *amsa-ja* (§§ 16, 17, 21). The Atharva Veda has the peculiar term *kaphoda* to denote the shoulder-blade (§ 43, cl 6).

2 All three lists of Ātreya-Charaka (Bheda), Suśruta, and Vāgbhata I, correctly state the number of shoulder-blades to be two, but there is a difficulty attending them which requires a word of explanation. The shoulder-girdle (Fig 12) comprises two bones, and no more. These are the scapula or shoulder-blade, and the clavicle or collar-bone. Examining the traditional lists of Ātreya-Charaka, Suśruta, and Vāgbhata I, we find a curious

¹ As a fact, the acetabulum is formed by the union of three bones, the ilium, ischium, and os pubis. The anal bone or coccyx does not enter into its formation, and should be omitted. The Suśrutīyan text is probably corrupt, as the confused manuscript readings indicate: see § 97, cl 6.

state of things Charaka apparently enumerates three bones (§ 4)—*amsa*, shoulder, *amsa-phalaka*, shoulder-blade, and *aksaka*, collar-bone. Vāgbhata I has the same threefold enumeration (§ 37). On the other hand, Suśruta appears to enumerate only a single bone, namely *aksaka*, or the collar-bone (§ 27). As regards Charaka, it has been shown in § 6 that the separate mention of *amsa*, shoulder, is an early error of the manuscript text caused by an inadvertent repetition, by some scribe, of the word *amsa* inherent in *amsa-phalaka*. In reality, therefore, the genuine list of Charaka (§ 7) knows only two bones as comprised in the shoulder, viz *aksaka*, clavicle, and *amsa-phalaka*, scapula. It is different with the list of Vāgbhata I. That list deliberately enumerates the shoulder-peak as a third bone by the side of the shoulder-blade and the collar-bone, for otherwise (see § 37) its total of 120 bones does not work out correctly. This, however, is only one of the numerous incongruities and blunders of the list of Vāgbhata I, and how he came to be betrayed into committing it has been explained in § 39, cl. 4.

3 As regards Suśruta, it has been shown in §§ 29, 30, 56, that the omission of the shoulder-blades from his list is a textual error, due in all probability to an ancient misreading (or false emendation), by some ignorant scribe who wrote *saṃjñā*, so-called, for *amsaṃ*, shoulder-blade, and that, as a matter of fact, Suśruta explicitly mentions the shoulder-blade as one of those bones which he classifies as pan-shaped (*kapāla*). In reality, therefore, the genuine list of Suśruta (§ 34) enumerates both bones which constitute the shoulder-girdle, the clavicle as well as the scapula. His explicit statement regarding the existence of the two bones, together with other evidence on the subject, has already been quoted in the preceding paragraph. An additional piece of evidence, however, may here be adduced. In the sixth chapter of his Anatomical Section (*Śāṇa Sthāna*), in which Suśruta enumerates the so-called 'vital spots' (*marman*) in the body, he says that 'there are eight such places in the bones', and among these eight bones he enumerates the *amsa-phalaka*, or shoulder-blades (Original Text in § 97, cl. 4).

4 The scapula is a large, flat, triangular bone (Fig 13) That the ancient Indian anatomists knew it to be a large, flat bone is shown by the fact of their calling it *phalaka*, which word means a board or slab But it is Suśruta alone who also notes its triangular shape. In the passage quoted in the preceding paragraph he particularly describes it as *triśa-sambaddha*, trebly bounded, that is, as being of a triangular form For the same reason of its triangular shape the sacrum likewise is called

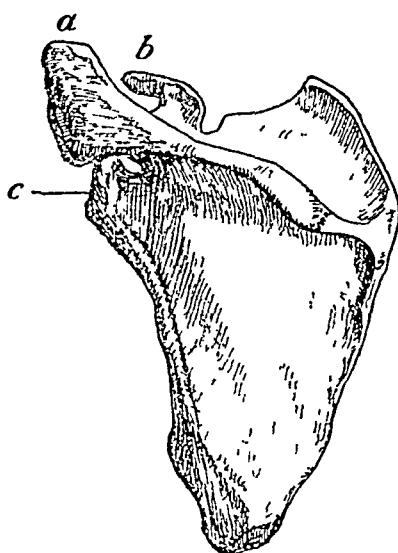


FIG 13

LEFT SCAPULA, *Amsa-phalaka* Posterior View

Showing—*a* Acromion process, *Amsa-kūta*

b Coracoid process

c Glenoid cavity, *Amsa-pītha*

triśa see § 60 In this connexion Dallana's explanation of the Suśrutian phrase *triśa-sambaddha*, triangular in form, is significant as showing the decay of anatomical knowledge subsequent to the time of Suśruta He says 'The place where the two collar-bones connect with the neck, that place is meant by the term *triśa*'¹ This place, as may be seen by referring to Fig 4,

¹ This explanation is also quoted in the *Bhāva Prakāśa* (Jiv ed, p 60) In the Bengali commentary, appended to the edition of that

has no apparent connexion with the scapula, and its mention in a description of the latter bone, accordingly, is quite out of place. The explanation of Dallana, however, would appear to be a tradition of considerable antiquity. For its incongruity would seem to have induced Vāgbhata I to change the text of Suśruta's description of the scapula. In the seventh chapter of the Anatomical Section of his Summary, quoting Suśruta's description, Vāgbhata I replaces the Suśrutian phrase *triśa-sambaddha*, triebly bounded or triangular, by the phrase *bāhumūla-sambaddha*, joined to the root of the arm, i. e. to the head of the humerus. Here we see that Vāgbhata I replaces the incongruous expression 'junction of the collar-bone with the neck' by the phrase 'junction with the head of the humerus'. Though this alteration doubtlessly now states a correct fact—the junction of the scapula with the head of the humerus in the glenoid cavity—it entirely abandons Suśruta's striking description of the triangular shape of the scapula, apparently because Vāgbhata I also did not know what to make of the Suśrutian term *triśa*.

§ 57 *The Thorax Sternum and Ribs*

1 *Uras* or *vakṣas*, breast, chest, *pārśva*, region of the ribs, *pārśvaka* or *parśuka*, rib. The organs denoted by these terms, which are common to all three writers, Ātreya-Charaka, Suśruta, and Vāgbhata I, form three sides of the thoracic cage (*pañjara*), the fourth side being formed by the *prsthā*, or back. The four sides of the thoracic cage are made up thus: the back by the thoracic vertebrae, which are included in the term *prsthā*, back (§ 58), the two sides by the ribs, denoted by the term *pārśvaka* or *parśuka* (§ 57), and the front, by the sternum and costal cartilages, which are jointly denoted by the term *uras* or *vakṣas*, breast.

2 Regarding the number of bones of the front of the thorax, that is, the breast (*uras*), the lists differ very considerably. Charaka's list (§ 4) counts fourteen, while the traditional

work by Debendranath and Upendranath Sengupta, p. 597, the place in question is explained as 'the most depressed spot of the vertebral column, well known under the name *triśa*' (*merudatter sarva-nimna triśa nāme prasiddha*)!

Recension of Suśruta's list (§ 27) counts only eight, and the list of Vāgbhata I (§ 37) agrees with the latter. Again, the Non-medical Version of Ātreya's list counts not less than seventeen. It has already been shown to be very probable that the latter number represents the true count of Suśruta, and that the number eight is properly the count of the list of Vāgbhata I, from which subsequently it was foisted into the list of Suśruta (§§ 33, 34, 40)

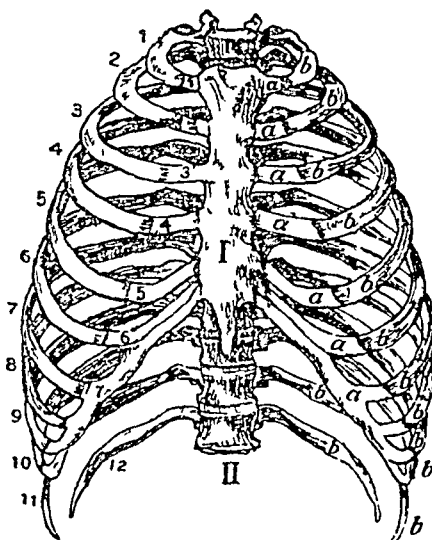


FIG 14

THE THORAX Anterior View

Showing—1-7, *a* Costal cartilages, *Jatru*

1-12, *b* Ribs, *Pārśvaka*

I Sternum, *Uras*

II Vertebral column, *Prs'ha-vamśa*

3 The bones of the organs that constitute the sides and back of the thoracic cage are satisfactorily accounted for in the next two paragraphs. The only bones that remain to be accounted for are those of the organs that constitute the front, that is, the sternum and the costal cartilages (Figs 14 and 16). It may, therefore, be justly concluded that these must account for the numbers mentioned by the Indian anatomists. The cartilages, we may remember (§ 30), are reckoned by them as 'tender'

(*taṛuṇa*) bones The costal cartilages (1-7, *a*, in Fig. 14) form the links that connect the sternal end of the shafts of the ribs with the sternum But only the seven upper ribs (distinguished as the 'true' ribs) are in this way connected The cartilages of the upper three 'false' ribs (eighth, ninth, tenth) are attached to the cartilage of the seventh rib The remaining two ribs (eleventh and twelfth) do not connect at all with the sternum, being 'floating' ribs It will be seen that these facts admit of two ways of counting the number of costal cartilages One may take them to be either seven or eight We have only seven cartilages, if we take those of the seventh, eighth, ninth, and tenth ribs which are attached to one another as constituting but a single cartilage, or we obtain eight cartilages, if we count the cartilage of the seventh rib and the cartilaginous attachments thereto of the eighth, ninth, and tenth ribs as two distinct cartilages Applying these alternative views to the whole of the cartilages, or 'tender' bones, of the breast, we have to count either seven or eight cartilages on either side of the sternum, that is, a total of either fourteen or sixteen cartilages, or 'tender' bones

4 Both views are represented in the lists of the ancient Indian anatomists Sūśruta counts sixteen bones, and these sixteen, together with the median bone of the sternum, make up the seventeen bones of the *maṣ* or breast, which we find in the genuine form of his list (§ 34) Charaka, on the other hand, counts only fourteen bones (§ 4) The difficulty in his case is that apparently he ignores the existence of the sternum one expects that he would count fifteen bones Considering that the sternum is a very prominent bone which even a less experienced anatomist would have no difficulty in feeling under the skin, it is inconceivable that Charaka (or rather Ātreya, whose system Charaka reports) should have failed to recognize it The probability is that Ātreya merely omitted to distinguish between bone and cartilage, that is, between the hard bone of the sternum and the 'tender' bone of the costal cartilages To him probably the sternum appeared to be merely a continuation of the latter which he considered as meeting in the median line of the breast He looked upon the front of the thoracic cage as formed by

a series of seven long bones, placed horizontally one above the other, and attached to one another in the median line. On the homological principle, he divided this series of bars into two halves, and thus obtained his total of fourteen bones.

5 Suśruta's treatment of the bones of the breast marks an anatomical advance, inasmuch as he distinguishes the sternum from the adjacent costal cartilages, and the cartilaginous attachments of the eighth, ninth, and tenth ribs from the cartilage of the seventh rib. Incidentally, moreover, Suśruta's count of seventeen bones of the breast has an important chronological bearing, inasmuch as the same count is found in the ritual *Śatapatha Brāhmaṇa* (see §§ 42, 62), the reputed author of which, Yājñavalkya, not being a medical expert himself, must have obtained his knowledge of the skeleton from the current surgical school of his time. Suśruta, therefore, must be placed earlier in date than the *Śatapatha Brāhmaṇa*.

6 It is not quite so easy to recognize a rational ground for the number eight of the list of Vāgbhata I. The only explanation that can be suggested is that it arose from an unintelligent attempt at combining the doctrines of Ātreya-Charaka and Suśruta. While accepting the former's theory of a series of bars, Vāgbhata I added to it an additional eighth bar, in conformity with the count of Suśruta. At the same time he abandoned the homological division into halves, which would have given him sixteen bones for the breast. The reason of this abandonment, probably, was that the duplication of the number eight (or, for that matter, of the number seven) would have interfered with his obtaining the requisite total of 360 bones for the whole skeleton (§§ 38, 41).

§ 58 *Continuation the Ribs, and their Appendages*

1 *Pāśva*, region of the ribs, *stana*, breast, *pāśvaka* or *parśuka*, rib, *sthāḷaka*, socket, *arbuda*, tubercle. The last three terms are peculiar to the list of Ātreya-Charaka (§ 4), from which they are adopted into the list of Vāgbhata I (§ 37). Suśruta uses only the first term, but that he agrees with the

theory of Ātreya-Charaka, implied in the use of the other three terms, is evident from the fact that both hold the same number of bones to constitute the *pāśva*, or region of the ribs. According to Ātreya-Charaka these bones number seventy-two, while according to Suśruta they number thirty-six on either side, and therefore seventy-two altogether. The term *stana* occurs in the list of the Atharva Veda (§ 43)

2 Suśruta does not explain how this number is arrived at, but Charaka states that there are twenty-four *pāśvaka* or *parśvaka*, ribs, twenty-four *sthālaka*, sockets, and twenty-four *arbuda*, tubercles. And, of course, as indicated by Suśruta's manner of counting, it is to be understood that there are twelve of each kind, that is, altogether thirty-six, on each side. Each rib (Figs 15, 16, 17) consists¹ of a shaft, and of a head with neck, also at the point of junction of these two parts there is a tubercle which articulates with the transverse process of the corresponding vertebra, and this transverse process has a facet, or very shallow cavity, for the reception of the tubercle. It is from this facet that the transverse process takes its name *sthālaka*, which word means a shallow socket. The transverse processes, though really a part of the vertebral system, are considered by the ancient Indian anatomists a part of the system of ribs by reason of their containing the sockets, or facets, for holding the ribs. The word *sthālaka* is a diminutive of the word *sthāla*, vessel, cup, or pan, and means a small or shallow cup or pan. In anatomical terminology the two words, *sthāla* and *sthālaka*, mean, respectively, socket for a tooth (§ 68) and shallow socket (or facet) for a rib. The name of the tubercle is *arbuda*, and the

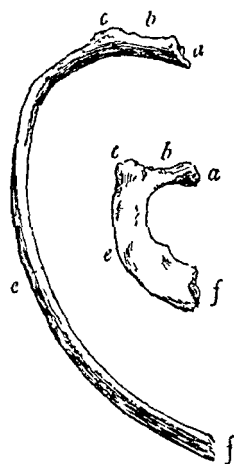


FIG 15
THE FIRST AND SIXTH RIBS

- a Head } *Sthālaka*
- b Neck } *Sthālaka*
- c Tubercle, *Arbuda*
- e Shaft, *Pāśvaka*
- f Extremity of Shaft, articulating with costal cartilage

¹ See Dr Potter's *Compend of Human Anatomy*, p 38

name of the shaft (including the neck), or rib proper, is *parśuka* or *pārśvaka*. Each of the three parts, the rib, its tubercle, and its corresponding transverse process, as usual with the ancient Indian anatomists (§ 44), is counted as a separate bone. It may be noted, however, that even admitting the Indian way of

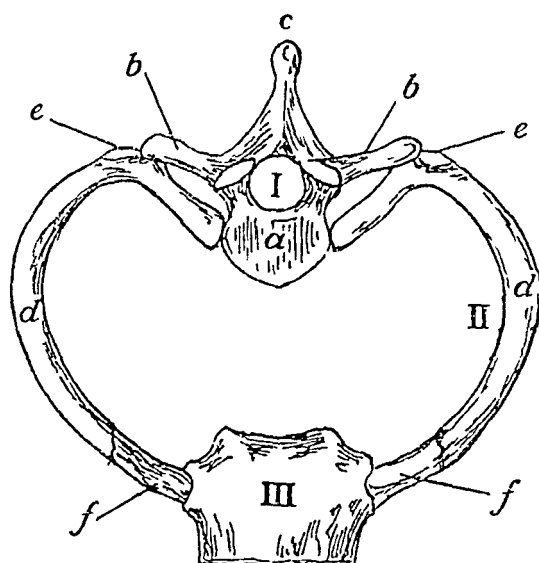


FIG 16

DIAGRAM OF TRANSVERSE SECTION OF THORAX

Showing—I Vertebra, *Prsthāsthū*, with *a* Body

b, b Transverse process, *Sthālaka*

c, c Spinous process

II Rib, with *d, d* Shaft, *Pārśvaka*

e, e Tubercle, *Arbuda*

f, f Costal cartilage, *Uras*

III Sternum, *Uras*

counting, there would strictly be only sixty-eight bones (or thirty-four on either side), because in reality there exist only ten tubercles on either side, the two lowest, or 'floating', ribs (the eleventh and twelfth) having no tubercles. But the Indian anatomists, owing to their usual fancy for symmetry (§ 44), count twelve tubercles, just as they count fifteen joints in the fingers and toes.

3 The only Indian writer, who, so far as I know, attempts to give a detailed explanation of the three terms *pārśvaka*, *sthālaka*, *arbuda*, and of their respective numbers, is Nanda Pandita. As his explanation differs from that above given, it becomes necessary to consider its claims to acceptance. It occurs

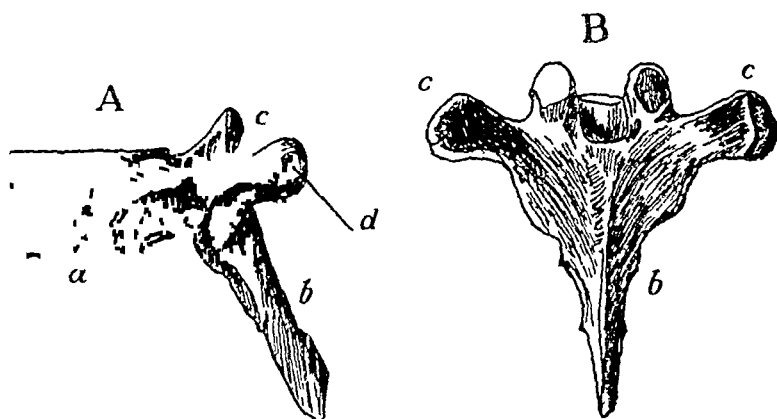


FIG 17

THORACIC VERTEBRA, *Kikasā*

A Lateral View

B Posterior View.

a Body

b Spinous process

c, c Transverse processes, *Sthālaka*, with d Facet for tubercle of rib

in his commentary on the Institutes of Vishnu, and runs as follows

There are thirteen ribs (*pārśvaka*) on either side, which aggregate to twenty-six. The tubercles, (*arbuda*), being the bones which connect the ribs with the breast (*vakṣas*), are ten on either side, which make twenty. The sockets (*sthālaka*), being the bones which connect them with the back (*prsthā*), are thirteen on either side, which make twenty-six. In this way, the ribs together with their tubercles and sockets amount to seventy-two (i.e. $26 + 20 + 26 = 72$) (Original Text in § 85.)

It is evident that in this explanation the tubercles (*arbuda*) are identified with the costal cartilages which connect the upper ten ribs with the sternum (Fig 16). But the term tubercle, *arbuda*, would be most inappropriate as applied to the costal cartilages. Moreover, the latter do not belong to the 'region

of the ribs' (*pārśva*), but to the front of the thoracic cage, or the breast (*was*), see § 57. Further, there are, strictly speaking, not ten costal cartilages, but only seven, for the four lowest connected ribs have, between them, only one cartilage. On this last point, indeed, theories of counting might differ, but what is fatal to the explanation of Nanda Pandita is the explicit statement in the list of Charaka that the numbers of the ribs, sockets, and tubercles are equal, there being twenty-four of each kind. Another fatal objection is that there are, as a fact, not 'thirteen ribs on either side', but only twelve. A thirteenth rib does occur in exceptional cases, but twelve is the normal number, and obviously that number alone can serve for the count. Moreover, it is most improbable that Nanda Pandita had any knowledge of the rare occurrence of an exceptional thirteenth rib. In all probability, he adopted his count of thirteen ribs from the *Śatapatha Brāhmaṇa* (see § 42, cl 9), which treats the collar-bone as a thirteenth rib, not realizing that by doing so he was duplicating the collar-bones which are separately enumerated in the list of the Institutes of Viṣṇu under the name *akṣa* (*akṣaka*).

§ 59 *The Vertebral Column*

1 *Prstha*, back, *prstha-vamśa*, lit back-row, i.e. vertebral or spinal column, *prsth-āsthī*, back-bone, or *prsth-gat-āsthī*, bone belonging to the back, or *prstī*, back-bone, all three denoting the vertebra. The first two terms are chiefly found in Sūśruta, the next two chiefly in Charaka and in the Non-medical version of the Institutes of Viṣṇu. The last term, *prstī* (or *prstī*), which properly denotes the transverse process of a vertebra, and thence the vertebra itself, is peculiar to the Vedas (§§ 42, 43), where it occurs in the plural number to denote the series of vertebrae or the vertical column.¹

¹ In the Vedas there occur the following further terms: *kīḷasa* for the entire spinal column, or for its cervical, or thoracic, portion, *anūka* or *anūhya* and *karūkara*, for its truncal portion, *anūka*, for its thoracic, or lumbar portion, and *udara* for its lumbar portion, also *karūkara* and *kuntāpa* for the transverse processes of the vertebra. See § 42, cl 3 and 4, also my article on *Ancient Indian Medicine*, in the *Journal of the Royal Asiatic Society* for 1907, pp 2-10.

2 The actual number of the bones of the entire vertebral column is twenty-six, consisting of twenty-four simple and two composite bones. The former are the true vertebrae, and comprise the seven cervical, the twelve thoracic, and the five lumbar

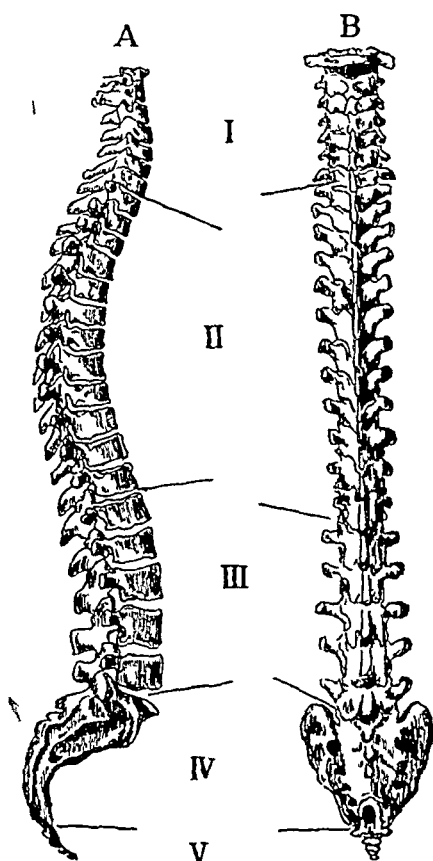


FIG 18

VERTEBRAL COLUMN, *Prstha-vamśa*

A Lateral View

B Dorsal View

I Cervical, *Grīvā*

II Thoracic, *Anūka*

III Lumbar, *Udara*

IV Sacrum, *Trika*

V Coccyx, *Guda*

vertebrae. The two composite bones are the sacrum or sacral bone, and the coccyx or anal (caudal) bone (Fig 18). Either of these consists of five vertebrae fused together, and hence known as the false vertebrae. It is to be noted, however, that

the first sacral vertebra is of a transitional and partly lumbar character, and occasionally remains permanently separate¹ It is this fact which appears to have caused Suśruta to count six lumbar vertebrae

3 As regards the cervical vertebrae, they are counted by the Indian anatomists separately, as constituents of the neck (§ 61) Moreover, in Suśruta's system, the sacral and anal bones also are

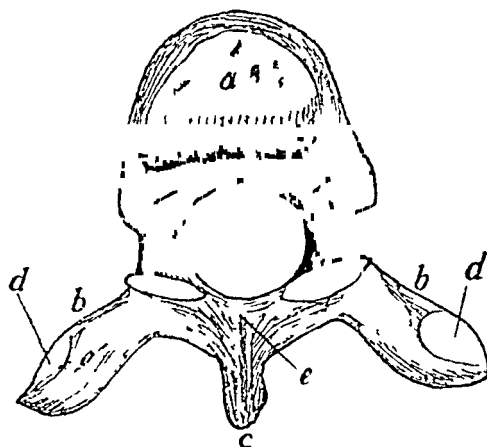


FIG 19

THORACIC VERTEBRA *Prsthāsthū* or *Prsth*

Superior Aspect

- a* Body *b, b* Transverse processes, *Sthālaka*
c Spinous process *d, d* Facets for tubercle of ribs
e Arch

counted separately as constituents of the pelvis (§ 60) There remain, therefore, only the twelve thoracic and five lumbar vertebrae, altogether seventeen, or, if we include the sacral and anal bones, nineteen bones to be accounted for Against these seventeen or nineteen bones Suśruta counts thirty, and Charaka forty-five In order to appreciate these large numbers correctly, we must

¹ In some quadrupeds, e g the gibbon, the normal number of the lumbar is six, and of the sacral four See Dr Gerrish, *Textbook of Anatomy*, 2nd ed, p 133, Dr Wiedersheim, *Structure of Man*, p 34

remember the peculiar practice of the Indian anatomists to count 'processes' as separate bones (§ 44, cl 1) Each vertebra (Fig 19) consists of a 'body' and an 'arch', the latter being constituted of three particularly prominent 'processes', viz the two transverse processes and the spinous process Charaka counts these four parts, that is, the body and the three processes of the arch, as separate bones On this point, Suśruta differs from Charaka, and it constitutes one of the two cardinal points of difference between the two systems (for the other, see §§ 65, 66) In the view of Suśruta, with his more thorough application of the principle of homology (§ 28, cl 2), the body and spinous process, both of which lie in the median line of the body, constitute but a single bone, while the two transverse processes, being homologous on the right and left sides of the body, are separate bones Accordingly, while Charaka counts four, Suśruta counts only three bones to each vertebra Moreover, with regard to the thoracic vertebrae, another point must be remembered Their transverse processes were reckoned by the Indian anatomists along with the ribs as their *sthāla*, or sockets, and have been already disposed of in the preceding paragraph It is only the body and spinous process of the thoracic vertebrae which are counted by them as 'bones belonging to the back' (*prsthā-gat-āsthī*)

4 The system of Suśruta counts thirty bones, exclusive of the vertebrae of the neck (§ 61) and the pelvis (§ 60) This number is made up thus

12 thoracic vertebrae (excl transverse)	12 bones
6 lumbar vertebrae (incl first sacral, and dividing each into body and two transverse) × 3	18 bones
Total	30 bones

In the case of the first sacral vertebra, its two alae (Fig 20, *21*) correspond to the two transverse processes of the ordinary lumbar vertebra

5 The system of Charaka counts forty-five bones Like Suśruta's system it excludes the vertebrae of the neck, but unlike it, it includes those of the pelvis (the sacral and anal bones) Accordingly its numeration is made up thus

12 thoracic vertebrae (excl transverse, but separating body and spine) $\times 2$	24 bones
5 lumbar vertebrae (separating body, spine, and two transverse) $\times 4$	20 bones
1 pelvic bone (incl sacrum and coccyx)	1 bone
Total	45 bones

6 The treatment of the pelvic bones by Suśruta and Charaka respectively shows the former's advance in anatomical knowledge. That Charaka took the sacrum and coccyx to constitute a single bone is shown by the circumstance (*infra*, cl 7) of Vāgbhata I adopting that count from him. Suśruta's more intimate knowledge of the structure of the pelvis is shown not only by the fact that he recognized the separate existence of the sacrum and coccyx, but also by the fact that he realized the peculiar shape of the sacrum as being triangular (§ 60, cl 3), and especially of its first vertebra as resembling that of the fifth lumbar, on which account, in fact, he counted the first sacral rather as a lumbar vertebra.

7 The system of Vāgbhata I is peculiar. Its aim is to combine the systems of Charaka and Suśruta (§ 38). Following the doctrine of the latter, Vāgbhata I counts thirty back-bones, excluding the sacral and anal bones from the vertebral column, and relegating them to the pelvis. But if he had reckoned these two as separate bones, he would not have been able to secure the required total of 360 bones for the whole skeleton. Accordingly, with regard to this count, he adopted the system of Charaka, and counted the sacrum and coccyx as constituting a single bone. In the system of Vāgbhata I, therefore, the term *triṅga*, or triangular bone, which he took over from Suśruta, includes both the sacral and anal bones (§ 60, cl 4).

§ 60 *The Pelvis Hip-bones, Pubes, Sacrum, Coccyx*

1 *Śroni*, pelvis, or the pelvic cavity, consisting of *śroni-phalaka*, or *nitamba*, hip-blade, *bhaga* or *bhag-āsthī*, pubes or pubic bone, *triṅga*, sacrum or sacral bone, and *guda* or *gud-āsthī*, coccyx or anal (caudal) bone. The term *śroni-phalaka* is peculiar to the

list of Charaka (§ 4), while Suśruta (§ 27) and Vāgbhata I (§ 37) use the term *nitamba*. The full form *bhag-āsthī*, bone of the pubes, or the pubic arch, is employed in the list of Charaka. The shorter form *bhaga* occurs in the lists of Suśruta and Vāgbhata I. In literary Sanskrit, and in popular usage, the word *bhaga* has the narrower meaning of the external female sexual organ, the vulva¹ (*yoni*), but in medical usage it has a wider meaning, irrespective of sex. There it denotes the inferior part, or base, of the trunk, that is, in the male, the space between the anus and sciotum, or the perinaeum, in the female, the space occupied by the vulva and the perinaeum. When not referring to the trunk as a whole, but to its bony constituents, *bhaga*, or more accurately *bhag-āsthī*, or bone of *bhaga*, denotes the bone contained in that inferior part, namely, the pubic arch, made up by the two ossa pubis and the symphysis (Figs 4, 21). It is quite correctly described by Chakrapāṇidatta (§ 11, cl 2, p 36) as 'the cross (*tryak*) bone which binds together the haunch-bones (ilium *plus* ischium) in front'. The full form *gud-āsthī*, or bone of the anus, anal (or caudal) bone, occurs in the Compendium of Vāgbhata II². But in the lists of Suśruta and Vāgbhata I the shorter form *guda* is used. That word ordinarily means anus, but of course in the lists, being the denotation of a bone, it must signify the anal, or caudal bone, that is, the coccyx.

2 Suśruta, in his statement on the skeleton (§ 27), explicitly states that the pelvic cavity is constituted of five bones, namely, the anal bone (*guda*), the pubic bone (*bhaga*), the two hip-bones (*nitamba* or *śom-phalaka*), and the triangular bone (*triṅka*, or sacrum). This agrees with the actual constitution of the pelvic cavity. For the pelvis includes the coccyx or caudal bone (*guda*),

¹ It is this circumstance which led to the absurdity, explained in § 9, of the inclusion of the male and female generative organs, *medhī-āsthī*, penis, and *bhaga*, vulva, by Gangādhara in his recension of Charaka's list of the bones of the skeleton. The usage of literary Sanskrit is taught in the great vocabulary, the *Amarakośa*, while the medical usage is defined in the medical vocabulary, *Rājamañjari*, see § 97, cl 7.

² e.g. *Aslāṅga Hṛdaya*, *Nidāna Sthāna*, chap ix, verse 1, in 1st ed, vol 1, p 758.

the triangular sacrum (*triṅka*), and the two ossa innominata. These last-mentioned bones consist, each of three parts, the ilium, ischium, and os pubis. The Indian anatomists prefer to divide the ossa innominata into two parts, namely a posterior and an anterior portion. The former, consisting of the ilium and ischium, exists in duplicate, one on the right, the other on the left side of the skeleton, and is named *śroni-phalaka* (or *nitamba*), blade of the pelvis, hip-blade. The latter is formed by the prominent pubic arch, and is called *bhag-āsthī*, bone of

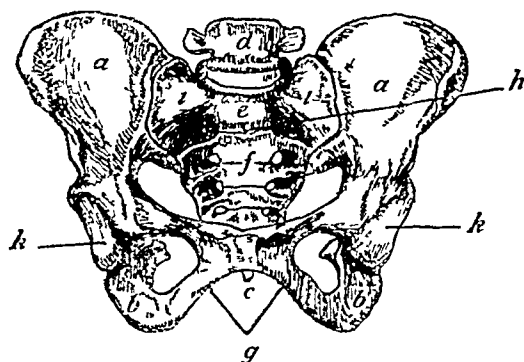


FIG 20

PELVIS, *Śroni* Anterior View

Showing—*a, a* Ilium *plus* (below) Ischium, *Nitamba*

b, b Ischio pubic arch, *Vitapa*

c Coccyx, *Guda* (see Fig 18)

d Fifth lumbar vertebra

e First sacral or sixth lumbar vertebra

f Sacrum (2nd-5th vertebrae), *Triṅka*

g Pubic arch, *Bhag-āsthī*

h Ridge between first and second sacral vertebrae

i, i Alae of first sacral or sixth lumbar vertebra

k, k Acetabulum, *Guda-bhaga-nitamba*

the pubes (Figs 4, 20). As this bone lies in the median line of the skeleton it is not subject to duplication by the homological principle, but (like the penis and vulva to which it gives attachment) it is counted, in the Indian anatomical system, as a single bone. In fact, it corresponds, in the lower part of the body, to the breast-bone or sternum, in the upper part, and thus the ischio-pubic arch (*vitapa*, § 28, footnote on p 72), connecting

the pubic arch with the ischium, is the homologue of the clavicular arch (*lakṣa-dhara*, clavicle), connecting the sternum with the shoulder. The pubic arch, of course, does not really consist of a single bone, but is made up of two bones, the ossa pubis, which form the two sides of the arch, and which are bound at the top of the arch by means of a cartilaginous disk forming the symphysis pubis. But it must be remembered that for the Indian anatomist cartilage is bone (§ 30), and from his point of view he was justified in regarding the whole arch as composed of a single bone. We must also remember that the mode of counting the bones of the skeleton is more or less arbitrary at all times. Modern anatomy counts the ilium and ischium as two separate bones, though, as a matter of fact, they are ankylosed in the adult. It does so as a matter of scientific convenience, and is justified in doing so by the circumstance that they are really separate in early life. Indian anatomists, on the other hand, having regard to the adult condition, count the ilium and ischium as constituting a single bone.

3 On the other hand, in the system of Ātreya-Charaka, the anal (*guda*) and sacral (*triṅka*) bones are not reckoned as parts of the pelvis, but as a portion of the vertebral column. In that system, indeed, those two bones are considered to constitute but a single bone, which is included among the forty-five vertebrae (§ 59, cl 5) without being named separately. This, as has been stated (§ 59, cl 6), is one of the marks of the divergent pelvic systems of Suśruta and Ātreya-Charaka. Suśruta seems to have been the first to count the sacrum and coccyx separately, and thus to recognize the distinction between true and false vertebrae. It is also not improbable that he was the first particularly to observe the triangular shape of the sacrum, and to give it the name *triṅka*, or triangle, which expresses that fact, and by which it is now generally known. It should be noted, however, that Suśruta's *triṅka* is not quite identical with the sacrum of modern anatomy. He treats the first sacral vertebra as belonging to the lumbar region, and as forming a sixth lumbar vertebra (§ 59, cl 2, 4). His sacrum, therefore, comprises only four vertebrae, and it constitutes the triangular bone which is made up of these four, and which subtends the ridge

that connects the two uppermost foramina of the sacrum (Fig 20, *h*)

4. Vāgbhata I, as usual, attempts to combine the systems of Ātreya-Charaka and Suśruta. From the latter he adopts the transfer of the sacral and anal bones from the vertebral column (*prsthā*) to the pelvis (*śroni*). But he follows the former in counting them as forming together a single bone, which he names *triṅka*, or triangular (§ 38, cl 3, § 39, cl 7)

C THE HEAD AND NECK

§ 61. *The Cervical Vertebrae, or Neck-bones*

1. *Gṛnā*, neck. This term is used in all the three lists, of Ātreya-Charaka, Suśruta, and Vāgbhata I, to denote the cervical column in the posterior part of the neck. The list in the Atharva Veda (§ 43) uses the term *śandha* in the plural number to denote the neck-bones.

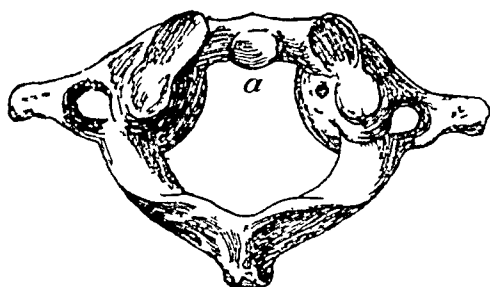


FIG 21

THE ATLAS, viewed from above

a Arch

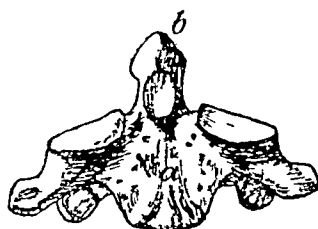


FIG 22

THE AXIS Anterior View

a Body

b Odontoid process

2. There is no part of the skeleton with regard to the number of bones of which the lists differ more widely. The list of Ātreya-Charaka (§ 4) makes the number of neck-bones to be fifteen. The Traditional Recension of the list of Suśruta (§ 27) makes it to be only nine, while the list of Vāgbhata I (§ 37) makes it to be thirteen. As a matter of fact, the number of the cervical vertebrae is seven, but they greatly differ among

themselves in some respects. The first vertebra, called the atlas (Fig 21), is practically a mere ring. It lacks the body and spinous process of the normal vertebra. The second vertebra, called the axis (Fig 22) consists practically only of a large strong body, surmounted by the odontoid process, on which as a pivot the atlas rotates¹. The remaining five vertebrae possess the normal type (§ 59, cl 3), and consist of a body and three (one spinous and two transverse) processes, but these processes, in all except the seventh, are short and bifid at the extremity (Fig. 23), and hence not very prominent. The seventh vertebra is exceptional. It approaches in shape the upper thoracic

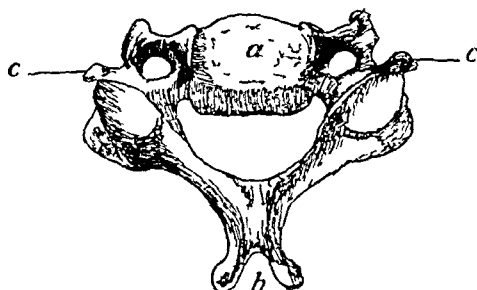


FIG 23

A CERVICAL VERTEBRA, viewed from above

- a Body
- b Bifid spinous process
- c, c Transverse processes

vertebrae, having a very long spinous process, whence it is called vertebra prominens, as well as large transverse processes².

3 These considerations fully explain Suśruta's count of nine neck-bones. He counted each of the six upper vertebrae as a single bone, but the seventh he treated in the same way as he treated the thoracic vertebrae (§ 59, cl 3), that is to say, he counted it as consisting of three bones, viz a body *plus*

¹ See Dr Gerrish's *Textbook of Anatomy*, 2nd ed, p 117. The odontoid process, in fact, is the body of the atlas from which it has become separated, and become ankylosed to the axis.

² *Ibid*, pp 117, 124, 'The spinous processes of the upper vertebrae are not readily felt in the living body, until we reach the 7th or sometimes the 6th spine.'

spine, and two transverse processes. He thus obtained $6 + 3 = 9$ bones.

4. Ātreya-Chaiaka obtained his total of fifteen bones by treating the cervical column somewhat similarly to the vertebral column (§ 59). He gave two transverse processes to each vertebra, counting them as separate bones, and looked upon the bodies of the vertebrae as constituting together a single columnar bone. He thus had twice seven transverse processes, or fourteen bones, *plus* one columnar body, or a total of fifteen bones. That this was really Ātreya's procedure is shown by a statement of the *Śatapatha Brāhmaṇa*, which is evidently based on Ātreya's theory of the cervical bones, and which says (§ 42, cl 3) of the neck-bones, 'Fourteen are the transverse processes, and their strength (or strong bone) is the fifteenth, hence by means of them, though they are very small, man can bear a heavy load'. At the same time, Ātreya's procedure shows that his knowledge of the structure of the cervical bones was not so intimate as that of Suśruta, for there is no single central columnar bone in the neck, and the transverse processes of the vertebrae are far less prominent in the neck than in the back¹ (Fig. 18).

4. As regards the count of Vāgbhata I, his total of thirteen bones probably represents, as usual, a compromise between the systems of Ātreya-Chaiaka and Suśruta. He appears to have counted two bones (transverse processes) for each of the cervical vertebrae, except the first, which, being a mere bony ring, without body and spinous process, was reckoned as a single bone. He would thus obtain his total of thirteen bones (i.e. $6 \times 2 = 12 + 1 = 13$).

§ 62 *The Windpipe*

1. *Kanṭhanāḍī*, lit. throat-pipe, or *jaṭru*, windpipe. The former term is peculiar to the list of Suśruta (§ 27), the latter is employed in the list of Ātreya-Chaiaka (§ 4). In the list of Vāgbhata I both terms occur, though they denote the same organ, this being (as explained in § 38, cl 4) one of its conspicuous incongruities.

¹ 'The transverse processes are rather short'—*Id.*, p. 116.

2 The windpipe consists of four parts, the larynx, trachea, and two bronchi (Fig 24). These four parts are enumerated by Suśruta as four distinct bones. On the other hand, Ātreya-Charaka counts the whole organ as a single bone. Strictly speaking, of course, the organ consists not of bone at all but of cartilage, but by the ancient Indian anatomists cartilage is regarded as a kind of tender, or immature (*taruna*) bone (§ 30, p 80).

3 The word *jatru*—so far as I am aware—is explained in all Sanskrit dictionaries (native Indian, as well as European) to

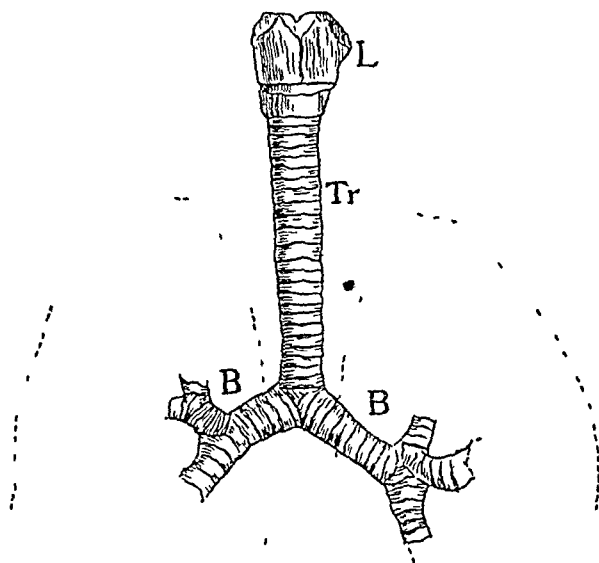


FIG 24

THE WINDPIPE, *Jatru* or *Kanthanāḍī*

L Larynx Tr Trachea B, B Bronchi

mean, not the windpipe, but the clavicle or collar-bone. This—so far as the occurrence of the word in medical literature is concerned—is a total mistake. It becomes, therefore, necessary to discuss more fully the correct meaning of the word ¹

4 In the earliest medical compendia the term *jatru* is either synonymous with *gr̥hā*, neck, or signifies more especially a

¹ See also a fuller discussion of this point in my article on 'Ancient Indian Medicine' in the *Journal of the Royal Asiatic Society* for 1906, pp 922 ff

particular aspect of it. The neck contains two structures, posteriorly the cervical column, denoted more particularly by the term *grīvā*, and anteriorly the windpipe, denoted more particularly by the term *jaṭru*. As the latter term, in a general way, also denotes the whole neck, Suśruta prefers, in his list of bones (§ 27), to employ the more specialized term *kanthanāḍi*, throat-pipe, to indicate the windpipe as distinguished from the cervical column. On the other hand, outside his list, he frequently uses the two terms *jaṭru* and *grīvā* as practically synonymous, to denote sometimes the windpipe, sometimes the neck generally. Thus in his class-list of the bones (§ 30), enumerating the cartilages, or tender bones (*taruna*), he makes them to include 'the nose, ears, neck (*grīvā*), and eyeballs' (Original Text in § 88). Here obviously the term *grīvā* cannot refer to the cervical column, but must denote the windpipe. Again in the sixth chapter of the Anatomical Section (*Śārīra Sthāna*), speaking of certain thirty-seven 'vital spots' (*marman*), he says (Jiv ed, p 336, cl 4) that they are situated 'from the neck (*grīvā*) upwards', but afterwards (Jiv, pp 342-3, cl 32), mentioning them in detail, he describes them as 'situated from the neck (*jaṭru*) upwards', and then, enumerating them, he mentions among their number some which are situated in the windpipe (*kanthanāḍi*) and others in the cervical column (*grīvā*). Here we have Suśruta employing the term *jaṭru* as synonymous with *grīvā*, neck, in a general way, and, again, specializing, he uses *grīvā* for the posteriorly-lying cervical column, but *kanthanāḍi* for the anteriorly-lying windpipe. Similarly Vāgbhata II (in his *Astāṅga-Hrdaya*, II 4, verse 2, in 1st ed, vol I, p 592), speaking of the same thirty-seven vital spots, says that they are situated *ūrdhvam jaṭroh*, or upwards of the neck, using *jaṭru* synonymously with *grīvā*. Again in the fifth chapter of the Pathological Section (*Nidāna Sthāna*), speaking of the rheumatic disease *manyā-stambha*, or rigidity of the neck, Suśruta says (Jiv ed, p 249, verse 69) *grīvā aparartate*, 'the neck becomes awry'. Similarly Charaka, or rather Dṛidhabala¹ (VI 26,

¹ The statement is really one of the Complementor Dṛidhabala, who wrote the chapter in question. He is expressly named as its author by Vijaya Rakṣita, the commentator of the Nidāna (Jiv ed, p 152).

verse 41a, Jīv ed, 1896, p 775), referring to the same disease, says *grīvā anta-āyamya*, 'the neck becomes bent inward' On the other hand, Vāgbhata I (*Astānga Samgraha*, III 15, vol I, p 300, last line, quoted by Vāgbhata II in *Astānga Hrdaya*, III 15, verse 22, in 1st ed, vol I, p 831), says *jatru-āyamya*¹ This shows that *grīvā* and *jatru* are synonymous terms Again, in the thirteenth chapter of the same section, speaking of the Valmika disease,² Suśruta tells us (Jīv ed, p 286) that, among other places, it occurs *grīvāyāmśūdhra-jatru*, in the cervical column and upwards of the windpipe, that is, in the neck generally Vāgbhata I, speaking on the same subject (*Astānga Samgraha*, VI 36, vol II, p 316, l 3, quoted by Vāgbhata II, in *Astānga Hrdaya*, VI 31, in 1st ed, vol II, p 682, verse 19b), says simply *jatru-śūdhvam*, from the neck upwards, omitting *grīvā*, and therefore using *jatru* as indicating the neck generally On the other hand, Mādhava, in his *Nidāna* (Jīv ed, p 276), paraphrasing the statement of Suśruta, uses the two terms *grīvā*, cervical column, and *gala*, windpipe, instead of Suśruta's *grīvā* and *jatru*, thus showing that he took *jatru* to be synonymous with *gala*, windpipe Again, in the fifteenth chapter of the Supplementary Section (*Uttara Tantra*), speaking of *hikkā*, or hiccup, Suśruta uses the term *jatru-mūlāt*, 'from the base of the neck' (Jīv ed, p 849, verse 9, quoted by Mādhava, in his *Nidāna*, p 105) The same phrase is used by Charaka (or rather Dīdhabala, VI 19, in Jīv ed, 1896, p 689, verse 30a) and Vāgbhata I (*Astānga Samgraha*, III 5, vol I, p 270, l 6, quoted by Vāgbhata II in *Astānga Hrdaya*, III 4, verse 22, in 1st ed, vol I, p 716) Gayadāsa, in his commentary on the Compendium of Suśruta (according to Vijaya Rakshita, in the *Madhukosa*, Jīv ed, p 105), explains here *jatru* by *grīvā*, neck, or *kantha*, throat The two terms *śūdhra-jatru* and *jatru-śūdhra* are synonymous, and denote one of the three parts into which the body is divided These three parts are (1) the four

¹ Both terms, *apavartate* and *āyamya*, according to the commentators, are synonymous of *vakṛī-bhavati* or *vakṛī-kriyate*, 'it becomes crooked' (*Nidāna*, p 152, *Astānga Hrdaya*, p 831)

² Suppurating scrofulous glands, according to Dr U C Dutt's translation in his edition of the *Mādhava Nidāna*, p 193

extremities (*śākhā*), (2) the trunk or middle (*antarādhī* or *madhya*), and (3) the neck and head (*śiro-griṇva*). It is the last-named portion which is also called *ūrdhva-jatru* or *jatruṇḍha*, i.e. 'the portion from the neck upwards', and inclusive of the neck. Both forms of the term are frequently met with. Thus Suśruta describing the respective scope of the various parts of Medical Science, in the first chapter of the Introductory Section (*Sūtra Sthāna*, Jiv ed, p 2), says of Minor Surgery, that it concerns itself with 'the cure of the diseases which have their seat in the portion of the body from the neck upwards (*ūrdhva-jatru*), that is, those maladies which affect the ears, eyes, mouth, nose, and other organs'. Chakrapāṇidatta, in his Commentary (*Bhānu-mati*, p 20), here says that the term *jatru* means 'the base of the neck' (*griṇvā-mūla*), and explains the phrase *ūrdhva-jatru* to mean 'from the neck (base of the neck) upwards' (*jatruṇa ūrdhvam*). Dallana, in his comment on the same phrase (Jiv ed, p 7), says that according to some '*jatru* means the base of the neck, and according to others, the point of junction of the sternum and clavicles'. In accordance with this definition, Suśruta, in the Anatomical Section, chap III, cl 7 (Jiv ed, p 337), enumerates certain vital spots (*marman*) as situated in the body from the neck upwards (*jatruṇḍhvam*). In the Pathological Section, chap I, verse 14, Suśruta again speaks of 'diseases seated in the organs from the neck upwards (*ūrdhva-jatru*)', and Dallana (Jiv, p 459) once more explains those diseases to be 'those affecting the eyes, mouth, nose, ears, and cranium'. Many other examples of this use of the phrase *ūrdhva-jatru* might be quoted from the Compendium of Suśruta, e.g. *Sūtra Sthāna*, XXI 30 (Jiv ed, p 68, l 20), *Cikitsita Sthāna*, XXXVI, 24 (Jiv, p 569), &c. The same usage is very common in the Summary of Vāgbhata I. The following examples may be quoted: the form *jatruṇḍhva* occurs in *Sūtra Sthāna*, chap XXIX (vol I, p 153, l 14), and chap XXXVI, (vol I, p 176, l 19), *Nidāna Sthāna*, chap XV (vol I, p 304, l 5), and *Uttara Sthāna*, chap XXXVI (vol II, p 315, l 21), quoted by Vāgbhata II in his Compendium (*Aṣṭāṅga Hṛdaya*), *Sūtra Sthāna*, chap XX, verse 17, chap XXVII, verse 11, *Nidāna Sthāna*, chap XVI, verse 22, *Uttara Sthāna*, chap XXXI,

verse 16 (in 1st ed, vol I, pp 373, 433, 842, vol II, p 681) The other form *ūrdhra-jatru* occurs in the Compendium of Vāgbhata II, *Sūtra Sthāna*, chap XX, verse 1 (vol I, p 368), where he refers to *ūrdhra-jatru-vikāra*, that is, 'diseases affecting the body upwards from the neck' The commentary of Aṣṇadatta here explains the phrase to refer to 'headache and similar diseases' (For the original texts of the passages quoted above, see § 98)

5 We will now turn to the commentators Suśruta, speaking about hiccup in the passage above quoted, mentions *jatru-mūla*, the base of the neck His statement is quoted by Mādhava in the seventh verse of the twelfth chapter of his *Nidāna* (Jiv ed, p 105) Vijaya Rakshita, commenting on this statement, quotes the explanations of Jayyata and Gayadāsa, two of the oldest commentators on the Compendium of Suśruta Jayyata explains *jatru-mūla* to be *kanth-orasoh sandhih*, that is, the junction of the throat with the breast-bone¹ This shows that he understood *jatru* to be synonymous with *kantha*, throat, and to denote the anterior part of the neck (*griṇā-mūlāḥ*) Gayadāsa explains *jatru-mūla* by *griṇā-mūla*, base of the cervical column, which shows that by him *jatru* was understood to be a synonym of *griṇā*, neck Again Chakrapānidatta (c 1070 A D), in his *Bhānumati* commentary on Suśruta, explains the phrase *jatru-na ūrdhram* in Suśruta I 7, (Jiv ed, p 71, top line), by *hanu-sandhan*, 'at the point of junction of the jaw (apparently the temporomandibular articulation)' This shows that he also took *jatru* to denote the throat (*kantha*) Again Dallana, in his commentary on Suśruta, IV 1, verse 139 (Jiv ed, p 644), explains *jatru* by *vakso-'msayoh sandhi*, the point of junction of the breast-bone and clavicle, which points to the base of the neck In fact, in his comments on Suśruta, I 23, clause 2 (Jiv ed, p 91, top line), as well as on Suśruta, I 21, clause 30 (Jiv ed, p 86, l 20), he explicitly identifies *jatru* with *griṇā-mūla*, the base of the neck Again Aṣṇadatta in his comments on Vāgbhata II's *Astānga*

¹ Dallana, in his commentary, also quotes that explanation But Jiv ed, p 1249, reads it falsely *vakso-orasoh sandhih*, junction of the amput with the breast-bone, which makes no sense

Hṛdaya, I 20, verse 1 (in 1st ed, vol I, p 368), repeats the explanation of Dallana that *jatru* signifies *vaḥso-'msayoh sandhr*, the articulation of breast-bone and clavicle. This definition is noteworthy as it modifies the meaning of *jatru*, which is no longer the throat or neck, but the base of the neck, and, for the first time, brings it into connexion with the clavicles. (For the original text of the passages, see § 98.)

6 The writers hitherto discussed are all medical. It will be observed that they never use the dual number with reference to *jatru*, as they would do if they were thinking of the pair of clavicles. They always use the singular number, indicating a single bone. Their evidence, on the whole, is uniformly and clearly in favour of *jatru* denoting in a general way the neck, or more particularly the throat, that is, the anterior part of the neck (*grīvā-purobhāga*), in short the windpipe. In the list of Suśruta (§ 27) *jatru* does not occur at all, but it enumerates the pair of bones, *grīvā* and *lanthanāḍī*, the cervical column and the windpipe. The list of Charaka (§ 4), on the other hand, does not name *lanthanāḍī*, but gives the pair *grīvā* and *jatru*. It is obvious that Suśruta's *lanthanāḍī* must be identical with Charaka's *jatru*, and that both those terms denote the same organ, that is, the windpipe.

7 Turning now to the non-medical evidence, we have the earliest in the Vedas. Here we find in the R̥gveda, VIII 1¹², *jatru* used in the plural number *purā jatrubhya ātīdah*, i e 'before making an incision in the costal cartilages'. So also in R̥gveda, XI 3¹⁰, *antīān jatruvaḥ*, i e 'the entrails are (represented by) the costal cartilages'. Whatever else *jatru* may mean, it can in these two passages not denote the clavicles, of which there are only two, and which would be expressed by the dual number. The plural excludes any reference to the clavicles. The meaning of *jatru* in the plural, however, is clearly indicated in a later Vedic work, the *Satapatha Brāhmaṇa*. It says (§ 42, cl 4), 'the ribs are fastened at either end, exteriorly to the thoracic vertebrae, and interiorly to the costal cartilages (*jatru*)'. It even mentions their number to be sixteen (§ 42, cl 3), 'there are eight costal cartilages (*jatru*) on the one side, and eight on the other, the sternum is the seventeenth (bone of the breast)'.

At the same time, it may be noted that Sāyana, in his great commentary on the R̥gveda, commenting on the first of the two above-quoted passages, explains *jatruḥ* by *grīvābhyāḥ*. He, therefore, took *jatru* to mean the neck (*grīvā*). If his interpretation should be preferred, it might refer to the cartilaginous rings of the trachea of which there are from sixteen to twenty (Fig 24). But the important point is that in the opinion of Sāyana *jatru* does not denote the clavicles. In the Epics and Purāṇas, *jatru* seems to have always the meaning of the anterior part of the neck or the throat. Thus *Mahābhārata*, III 713, *jatruḍeṣe vgarāśīdat*, i e he fell on his throat, and *Bhagavat Purāṇa*, VIII 11¹⁴, *jatruśatūdayat*, he struck him in the throat. The singular number shows that the clavicles are not intended. Again, in *Rāmāyana*, I 1¹² and V 32¹⁰, we find the phrase *dr̥ḍha-jatru*, and in *Bhagavat Purāṇa*, I 19²⁷, the phrase *nigūḍha-jatru*, both meaning 'strong-necked', in the description of a hero. Here, indeed, the late commentators Rāmānuja and Śrīdhara expressly interpret *jatru* of the two clavicles, using that word in the dual number. Thus Rāmānuja on *Rāmāyana*, I 1¹², says *Jatruṇī vakso'msa-sandhi-gate asthūnī*, i e 'The two clavicles are the two bones which constitute the connexion between the breast (sternum) and the shoulder (acromion)'. Similarly Śrīdhara, commenting on *Bhagavat Purāṇa*, I 19²⁷, says *Kantḥasya adho-bhāgayoh sthite asthūnī jatruṇī*, i e 'The two clavicles are the two bones which are situated on both sides of the lower part of the throat'. But though in these explanations Rāmānuja and Śrīdhara have obviously in view the traditional medical definition of *jatru*, as above quoted from the commentaries of Dallana and Arunadatta, they understand that definition in the false sense to which, as we shall see below, the celebrated Indian dictionary, the *Amara-kośa*, had given currency. Anyhow, in the passages of the Epics and Purāṇas, commented on by them, the most natural interpretation of *jatru* is that it means the throat or windpipe.

8 In the Non-medical Version (§ 16) of the statement on the skeleton, as found in the Law-book of Yājñavalkya and in the Institutes of Viṣṇu, *jatru* clearly has the meaning of windpipe, for it explicitly says that there is a single *jatru*. It is true that the text of Yājñavalkya, published by Professor Stenzler (p 89),

reads *jatrvzekaikam*, which, of course, can only mean 'one collar-bone on either side', that is, two collar-bones. But, as may be seen from the evidence set out in § 77, the true manuscript reading is *jatrvzecam ca*, that is 'and one windpipe'. It is unfortunate that the editors and translators of two legal treatises allowed themselves to be misled by the ill-considered explanations of the legal commentators (§ 20) into ascribing to those treatises the doctrine that *jatru* referred to the two clavicles.

9 So far as the matter can be traced at present, the first, and really the sole, authority for interpreting *jatru* of the clavicles is the *Amarakosa*, an ancient Sanskrit dictionary written by Amara Simha, probably in the seventh century A.D. In that work, after explaining the word *amsa* to be a synonym of *bhugaśiras*, or head of the arm, Amara Simha proceeds to say (II 6⁷⁸), *Sandhī tasya eva jatrunī*, i.e. 'The two junctions of that (*amsa*, or head of the arm) are the two collar-bones'. Though not very clearly expressed, it is yet clear from the context and the dual number that, in explaining the word *jatru*, he was thinking of the two clavicles. His idea seems to have been that *jatru* was the name of the two bones which run horizontally across the body from one 'head of the arm' (or acromion process) to the other, connecting them with each other and with the base of the neck (Fig. 4). How this idea originated is not exactly known, but the following explanation may be suggested. It seems to be a misunderstanding of the two anatomical terms *amsa*, collar-bone, and *sandhī*, joint or articulation. The former, as stated already, is interpreted by Amara Simha to mean 'the head of the arm' (*bhugaśiras*)¹—a term which evidently is the popular, though inexact, equivalent of the anatomical term *amsa-kūta*, peak of the shoulder (acromion process, § 55, cl 5). It is possible that this interpretation was suggested to Amara Simha by the peculiar use of the term *amsa* in the

¹ Hemachandra (c. 1140 A.D.) in his well-known dictionary called *Abhidhāna Chintāmaṇi*, adopts Amara Simha's interpretations. In Section V, verse 588, he says *amso bhugaśirah skandho jatru sandhiv-uro-'msagah*, i.e. *amsa* or *skandha* is the head of the arm, and *jatru* is the connecting bone between sternum (*uras*) and the head of the arm (*amsa*).

osteological summary of Vāgbhata I¹ In that summary, as shown in §§ 39, cl 4, and 56, cl 2, *amsa* occurs by the side of *alsaka*, clavicle, and *amsa-phalaka*, shoulder-blade, and therefore, if it has any specialized meaning, it can mean only the peak of the shoulder, or the head of the arm. Having once adopted this interpretation, Amara Simha was naturally led, by the traditional medical definition of *jatru*, to the further misinterpretation of the latter term. That definition (as reported by Dallana and Arunadatta, *ante*, cl 4) was that *jatru* signified *vakso 'msayoh sandhi*, that is, the sterno-clavicular articulation. But Amara Simha, having taken *amsa* to mean the head of the arm, was of necessity driven to interpret the term *sandhi* to signify 'a connecting bone', and the definition in question to mean that *jatru* signified the clavicle, because it was the connecting bone (*sandhi*) between the sternum (*vakṣas*) and the head of the arm (*amsa*)². But this is not in accordance with anatomical usage: in the latter, *amsa* signifies the collar-bone, and *sandhi*, an articulation, that is, the connexion between two contiguous bones. The two terms do not signify, respectively, the summit of the shoulder, and a joint in the sense of a bone that lies between two articulations and connects two other bones. The true anatomical definition of *jatru* is that it is the sterno-clavicular articulation, or, as it is also sometimes, though less technically, expressed, the base of the neck (*grīvā mūla*). Outside the medical schools, the false interpretation of *jatru*, apparently started by the *Amarakośa*, that it meant the two clavicles, succeeded in winning general acceptance, so much so that its original and real meaning is, at the present day, practically lost sight of.

10 To sum up from the foregoing discussion the conclusion

¹ This seems to me the more probable view, though pending the exact determination of the date of Amara Simha and Vāgbhata I, the question of priority—assuming that there was any interdependence—must remain uncertain.

² The natural corollary of giving to *amsa* and *jatru* the meaning of 'head of the arm' and 'collar-bone' respectively is that *amsa-kūta* and *alsaka* become superfluous, and, as a fact, both those words are omitted in the *Amarakośa*.

suggests itself that the original meaning of the word *jatru* may have been 'immature bone' or cartilage. Originally the word was used to denote the cartilaginous portions of the neck and breast, that is, the windpipe and the costal cartilages. In the Vedas it still has this undefined meaning. In the medical textbooks its use is limited to the cartilaginous portion of the neck, i.e. the windpipe (Charaka), and hence, either to the neck generally, or to the sterno-clavicular articulation at the base of the neck (Suśruta). At a comparatively late date (sixth or seventh century A.D.), and in general literature, owing to a misinterpretation of the anatomical terms *sandhi* and *amsa*, it was made to mean clavicle.

§ 63 Cranial Bones

1 *Śiras*, cranium or brain-case, *śirah-kapāla*, cranial pan-shaped bone. These two terms are employed in all the three lists, which differ only in respect of the number of the bones. While Charaka (§ 4) counts four, Suśruta (§ 27) counts six bones, and Vāgbhata I (§ 37) adopts the count of Suśruta.

2 The brain-case or cranium is a hemispheroidal, oval box, made up of eight bones, namely the frontal, the two parietal, the two temporal, the occipital, the sphenoid and the ethmoid (Figs 25, 26). Nearly the whole of it, viz. the entire vault and the larger portion of the base, is externally visible; the remainder of the latter lies internally within the skull. The externally visible portion of the cranium comprises six bones, the frontal, the two temporal, the two parietal, and the occipital. The interior, invisible portion comprises two bones, the sphenoid and the ethmoid. These two interior bones, including the small portion of the sphenoid, which shows externally by the side of the frontal (Fig. 25), were not known to the Indian anatomists. As pointed out in § 45, cl. 3, their method of dissection would not enable them to discover them, and so far as the two cranial surfaces of the sphenoid bone (Fig. 32) are concerned, they do not seem to have recognized their existence as separate from the frontal bone and as belonging to the sphenoid. In all probability

they took them to be but continuations of the contiguous frontal bone. As to the temporal bones, they are peculiarly liable to detachment from the rest of the bony case, and it may have been for this reason that they were separately enumerated by the Indian anatomists, they are dealt with

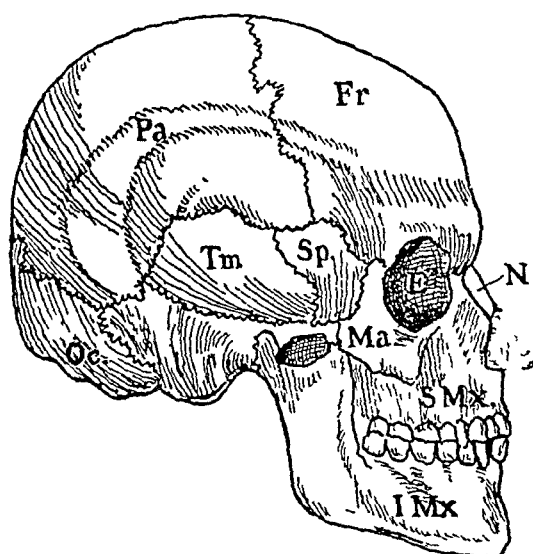


FIG 25

PROFILE OF THE SKULL From the right

- Showing—Fr = Frontal bone
 Pa = Parietal „ } *Śirah kapāla*
 Oc = Occipital „ }
 Tm = Temporal, *Śankhaka*
 Sp = Sphenoid
 E = Ethmoid (in inner wall of orbit)
 Ma = Malar, *Gandakūta*
 N = Nasal, *Nāsikā*
 S Mx = Superior maxillary } *Hanu*
 I Mx = Inferior maxillary }

in the next paragraph. There remain only four bones, the frontal, the two parietal, and the occipital, and there can be no doubt that it is these four bones which are referred to in the list of Chanaka as 'the four pan-shaped bones of the cranium'. They are more or less decidedly concave bones, and therefore are rightly described as pan-shaped (Figs 27, 28)

3 The list of *Suśruta* substitutes six pan-shaped bones in the place of the four bones of *Charaka*. In order to understand this

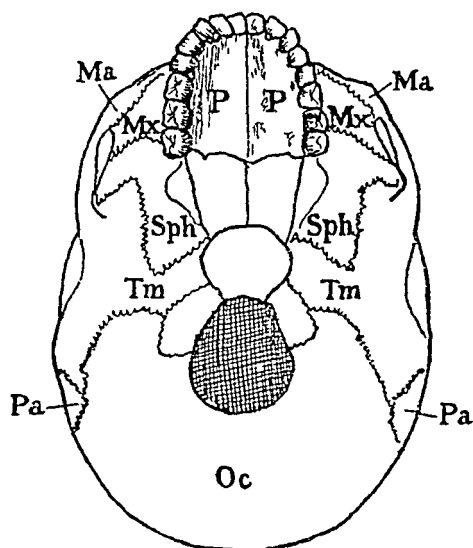


FIG 26

OUTLINE OF BASE OF SKULL

Viewed from below

Showing—Oc = Occipital	Mx = Superior maxillary
Pa = Parietal	Ma = Maxilla
Tm = Temporal	P = Palate
Sph = Sphenoid	E = Ethmoid (not visible)

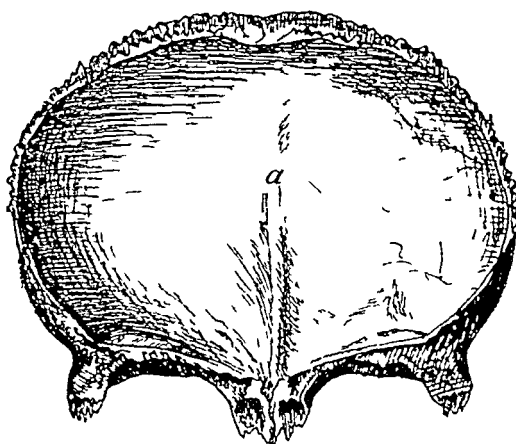


FIG 27

FRONTAL BONE, *Suśah-kapāla*

Internal Surface, showing frontal crest "a"

difference we must remember that Suśruta's osteological system is strictly dominated by the principle of homology (§ 28), according to which the skeleton is considered as consisting of two lateral halves divided by a mesial plane running through the vertebral column. This plane cuts the frontal and occipital bones into two halves. As a matter of fact, these two bones consist of two halves, indicated by the frontal and occipital crests respectively (Figs 27 and 28). In the case of the occipital bone it is true, the two halves coalesce into one from the beginning of

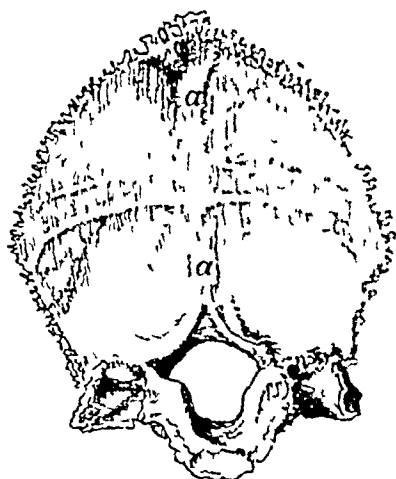


FIG 28

THE OCCIPITAL BONE, *Sirah-lapāla*

Internal Surface, showing occipital crest *a, a*

embryonic development, but in the case of the frontal bone they remain separated by the metopic suture, and do not become fused till about the fifth or sixth year after birth. In fact, traces of the metopic suture persist throughout life between the two superciliary ridges of the frontal bone, and in a certain percentage (about 8 per cent) of individuals even the whole of it persists in the adult¹ (Figs 29, 32). Either of the two halves of the frontal and occipital bones forms a separate cavity, divided by their respective crests (Figs 27 and 28). Thus Suśruta is

¹ I am indebted to Professor Arthur Thomson for the suggestion of this explanation

justified in counting 'six pan-shaped bones of the cranium', these being, on his principle of division, two frontal, two parietal, and two occipital. In fact in this particular, his system marks an advance on that of Ātreyā-Charaka, inasmuch as it shows Suśruta's acquaintance with the existence of the metopic suture. He had, no doubt, observed its surviving traces between the superciliary

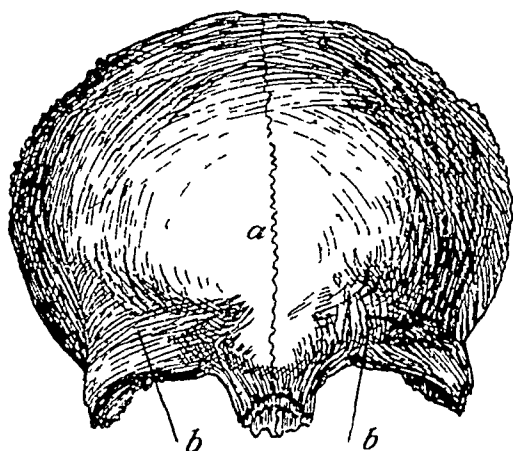


FIG 29

FRONTAL BONE, *Sṇah-kapāla*

Anterior view, showing—*a* Metopic suture
b, b Superciliary ridges

ridges, and may even have noticed the exceptional occurrence of a 'metopic skull'. The division of the occipital bone into two halves, however, was the natural resultant of his homological principle.

§ 64 Continuation the Temples

1 *Śaṅkha*, temple, *śaṅkhaka*, temporal bone. The latter form of the term is found only in the Non-medical Version (§ 16), though, of course, there is no real difference of meaning between the two terms.

2 All the three lists give the number of the temporal bones as two. Suśruta, moreover, rightly classes them among the pan-shaped (*kapāla*) bones (§ 30). They are, without any doubt

identical with the two temporal bones which are recognized also by modern Anatomy as bones of the cranium, one on either side (Figs 25, 26)

§ 65 *Facial Bones Maxillaries*

1 *Hanu*, jaw, *hanu-asthi*, jaw-bone, or chin, *hanu-mūla-bandhana*, bond, or tie-bone, at the base, or back, of the jaw, *hanu-citya*, pile or structure of the jaws. The term *hanu* properly means simply a jaw, and ordinarily may indicate both, the upper as well as the lower jaw. But it is in the treatment of these bones as well as of the other bones of the face which are discussed in the next paragraph, that the second of the most striking differences (for the first, see § 59, cl 3) between the systems of Ātreya-Charaka and Suśruta discloses itself. The difference, stated briefly and roughly, is that the system of Ātreya-Charaka (§ 4) recognizes the existence of only one jaw, viz the lower, while the system of Suśruta includes two jaws, the lower and the upper. Accordingly, in the former system, the term *hanu-asthi* signifies the bone (or 'body') of the lower jaw, and particularly its more prominent portion, the chin, while the term *hanu-mūla-bandhana* signifies the two attachments (or 'rami') at the base, or back, of the lower jaw. In the list of Vāgbhata I (§ 37) there occurs only the term *hanu-bandhana*, jaw-attachment, which is used in a loose way as synonymous with simple *hanu*, jaw (see § 38, cl 6). The term *hanu-citya* is peculiar to the Atharva Veda (§ 43).

2 Suśruta's way of counting the jaw-bones agrees generally with that of modern Anatomy. The two maxillaries really consist each of two bones, but their two lateral halves are so intimately united by harmonic sutures that they are counted each as a single bone. In the same way Suśruta counts two *hanu* or jaw-bones, which, therefore, practically correspond to the maxillaries. Ātreya-Charaka, on the other hand, does not recognize the existence of a maxillary as a single bone. He divides either of them horizontally into a number of separate bones (Figs 31 and 32). The superior maxillary (Fig 30) consists of two parts, the body and certain processes. The chief of the latter are, (1)

the palatine process which forms the hard palate (*tālu* or *tālūsaka*), and which is counted by both Ātreya-Charaka and Suśruta as a separate bone (§ 67), and (2) the alveolar process which contains sockets of the teeth. This alveolar process, too, is counted as a separate bone, but by Ātreya-Charaka alone, who calls it *dant-olūkhala*, or tooth-socket bone. As to the 'body' of the superior maxillary, it would appear that Ātreya-Charaka looked upon it as being continuous with and forming part of the malai bones (§ 66). In the system of Ātreya-Charaka, therefore, there

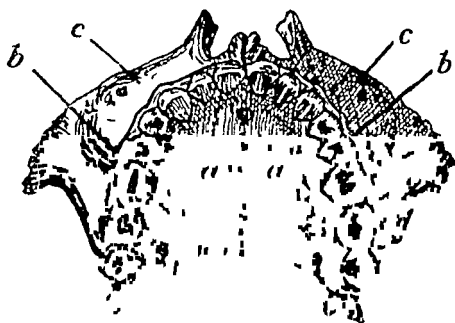


FIG. 30

SUPERIOR MAXILLARY, *Hanu* From below

- a, a Palatine process, or hard palate, *Tālūsaka*
- b, b Alveolar process, *Dant-olūkhala*
- c, c Body of maxillary

is practically no superior maxillary. It is replaced by three bones, (1) the hard palate (*tālūsaka*, § 67), (2) superior alveolar process, or tooth-socket bone (*dant-olūkhala*, § 68),¹ (3) the malai bone, of which the 'body' of the maxillary forms a part (Fig 32). On the other hand, the system of Suśruta, consequent on its recognizing a superior maxillary bone (*hanu*), does not admit any separate tooth-socket bone. At the same time Suśruta's *hanu*, or upper jaw-bone, does not fully correspond to the superior maxillary, 'because of its excluding the palatine process, which Suśruta (equally with Ātreya-Charaka) counts as a separate bone (*tālu*, § 67)

¹ That is, strictly, the set of thirty-two superior tooth-socket bones

3 The inferior maxillary (Fig 31) is a large, strong, horse-shoe-shaped bone, which consists of a nearly horizontal body, and two posterior vertical portions, or rami. The body itself consists of three portions, the alveolar process above, the base beneath, and the mental protuberance, or chin, in front. The whole of this inferior maxillary is counted as a single bone by Suśruta, and constitutes his other *hanu*, or jaw-bone. Ātreyā-Charaka, on the other hand, treats it as consisting of four bones: (1) the alveolar process (*dant-olūkhala*), (2) the base with the chin, which he calls *hanu-asthi*, or jaw-bone (chin-bone), (3) and

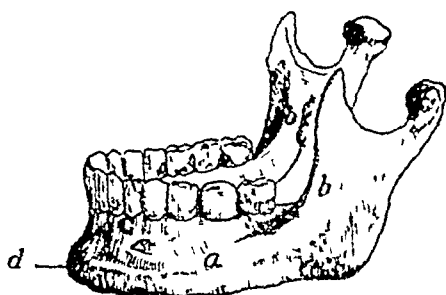


FIG 31

INFERIOR MAXILLARY, *Hanu* Seen from the left

- Showing—*a* The base of the body, *Hanu-asthi*
b, b The rami, *Hanu-mūla-bandhana*
c Alveolar process, *Dant olūkhala*
d Mental protuberance, or chin, *Hanu-asthi*

(4) the two rami, which he calls *hanu-mūla-bandhana*, bonds at the root, or back, of the jaw-bone. He calls the rami by this name on account of their being the bones by which the 'body' of the lower jaw is attached to the rest of the skull.

4 To sum up irrespective of the hard palate, which both Ātreyā-Charaka and Suśruta count separately, the list of Suśruta represents the two maxillaries by two *hanu*, or jaw-bones, while the list of Charaka breaks them up into—(1) two alveolar processes (*olūkhala*), (2) one (lower) jaw-bone (*hanu-asthi*), (3) two rami (*hanu-mūla-bandhana*), and (4) probably a portion of his peculiar central facial bone (§ 66). This is shown in the sub-joined tabular statement.

Modern Anatomy		Ātreya-Charaka	Suśruta	Vāgbhata II
Sup Max	1 palatal process	<i>tālūsaka</i>	<i>tālu</i>	<i>tālu</i>
	2 alveolar process	<i>ulūkhala</i>	1st <i>hanu</i>	<i>ulūkhala</i>
	3 body	facial bone (K, fig 32)		1st <i>hanu-bandhana</i>
Inf Max	1 alveolar process	<i>ulūkhala</i>	2nd <i>hanu</i>	<i>ulūkhala</i>
	2 base	{ <i>hanvasthi</i>		{ 2nd <i>hanu-bandhana</i>
	3 chin			
	4 ramus	<i>hanu-mūla-bandhana</i>		

5 The system of Vāgbhata I represents, as usual, a compromise between the two systems of Ātreya-Charaka and Suśruta. From the latter he adopts the two *hanu* or jaw-bones, and from the former the two *dant-ulūkhala*, or tooth-sockets. In the main, therefore, inasmuch as he holds not one, but two jaw-bones or maxillaries, he is a follower of Suśruta, but as a concession to the doctrine of Ātreya-Charaka, he divides each maxillary into two separate bones, viz its alveolar process (*dant-ulūkhala*) and its body (*hanu-bandhana*), the latter including, in the case of the inferior maxillary, its two ramus. Another concession to that system appears to be Vāgbhata's use of the term *hanu-bandhana*, instead of the simpler Suśrutian term *hanu*. It seems probable that Vāgbhata I failed to understand the significance of the word *mūla* in the Charakian term *hanu-mūla-bandhana*, bond at the base, or back, of the jaw. That word renders the term applicable only to the lower jaw-bone, and signifies its two ramus, by which it is attached to the rest of the skull. The omission of the word *mūla* shows that Vāgbhata I understood the term *hanu-bandhana* to be applicable to both jaw-bones, and to indicate that the jaw-bones were attachments of the skull. In his system, therefore, the term *hanu-bandhana* is a mere descriptive synonym of the simpler term *hanu* (§ 38, cl 6).

6 The system of the Atharva Veda (§ 43) appears to be essentially the same as that of Ātreya-Charaka. This seems to

be indicated by its term *hanvoh utya*, or structure (pile) of the two jaws, inasmuch as that term points to the view of the jaw being a composite organ built up, as Ātreyā-Charaka holds, of the separate bones which he calls *dant-olūkhala*, alveolar process, *hanv-aśthi*, jaw-bone, and *hanu-mūla-bandhana*, two rami

§ 66. Continuation Malar and Nasal Bones, Superiliary Ridges

1 *Nāsā* or *nāsikā*, nose, nasal bone, *ganda*, cheek, cheek-bone, malar bone, *ganda-kūta*, or *hanu-kūta*, malar prominence, *lalāta*, brow or superiliary ridge, *lakātikā*, denoting the combined nasal and malar bones. The last term is peculiar to the Atharva Veda. The term *lalāta* is only found in the several versions of the system of Atreya (§§ 4, 12, 16), and in the Atharva Veda (§ 43). The term *hanu-kūta* is peculiar to the list of Bheda (§ 12). Charaka prefers the term *ganda-kūta*, and Suśruta, its shorter alternative *ganda*.

2 Beside the two maxillary bones which have been discussed in the preceding paragraph, and the palatal bones which will be discussed in the next paragraph, the face of the skeleton (Fig. 32) comprises the following bones: two malar, two nasal, two lachrymal, two inferior turbinated, and one vomer. Of these bones the five last-mentioned are very small, and lie in the interior of the skull. It cannot, therefore, surprise us that they escaped the observation of the ancient Indian anatomists. The only bones which, forming a portion of the external skull, came under their notice, are the malar and nasal bones of the cheek (*ganda*) and nose (*nāsā* or *nāsikā*) respectively. But regarding the nature of these bones, and, in fact (as already stated in § 65, cl. 1), regarding the structure of the face generally the opinions of Ātreyā-Charaka and Suśruta differ very considerably. It is on this point that the two systems show one of their two most striking divergences (for the other see § 59, cl. 3).

3 In the systems of Ātreyā-Charaka (§ 4) those four bones, the two malar (*ganda-kūta*) and the two nasal (*nāsikā*), are considered as forming, together with the two superiliary ridges, or brows (*lalāta*), a single continuous central line which lies across the

middle of the face of the skull, bounded by the frontal bone above, the alveolar process of the superior maxillary below, and the two temporal bones on either side. The configuration of this central bone, and its position in the face, are indicated by dotted

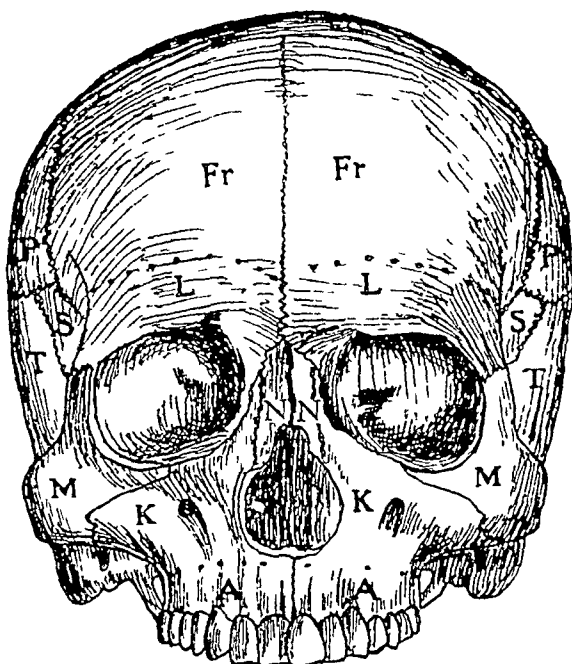


FIG 32

ANTERIOR VIEW OF SKULL

Showing, within dotted lines, the central facial bone (K, L, M, N)

- | | |
|---------------------------------|-----------------------|
| Fr = Frontal bone | } <i>Śn ah-kapāla</i> |
| P = Parietal bone | |
| S = Sphenoid bone | |
| T = Temporal bone, | <i>Śan khaka</i> |
| L = Superciliary ridges, | <i>Lalāta</i> |
| N = Nasal bones, | <i>Nāsikā</i> |
| M = Malar bones, | <i>Ganda-kūta</i> |
| K = Body of superior maxillary, | <i>Kakā'ikā</i> |
| A = Alveolar process, | <i>dant-olūkhala</i> |

lines in Fig 32. It will be seen from it that the central facial bone must include also the 'body' of the superior maxillary, which appears to have been looked upon as forming a continuous whole with the contiguous cheek or malar bones (*ganda*,

or *ganda-kūta*) A more experienced anatomist, such as Suśruta was, could not fail to see that what was supposed to be an undivided central bone was in reality a very composite structure, made up partly of a number of separate small bones, partly of portions of the bones contiguous to the hypothetical central bone. The former are the two malar bones and the two nasal bones, which accordingly Suśruta counted separately in his list (§ 27). The latter are (1) the superciliary ridges which form merely two prominent portions of the frontal bone, and (2) the lower part of the hypothetical central bone which forms really the 'body' of the superior maxillary. Consequently Suśruta altogether omitted the two superciliary ridges, or brows (*lalāta*), from his list, while he included (as shown in § 65) the lower part of the central bone in one—the upper—of his two jaw-bones (*hanu*). With regard to the nose, including its cartilaginous portion, Suśruta counted three bones. In accordance with his homological principle, he took the two nasal bones as constituting a single bone in the median line, and added the two lateral cartilages of the external nostrils. That he included the latter is proved by the fact of his enumerating the nose (*ghrāṇa*) among the tender bones (*taruṇa*)—see the class-list of the bones in § 30.

4 As to Vāgbhata I, he follows his usual practice of compromise. With Suśruta he holds the separate existence of two nasal, two malar, and two maxillary bones, and with Ātreya-Charaka the separate existence of the superior alveolar process. In the main, therefore, his system agrees with the system of Suśruta, the only difference being that (as already pointed out in § 65, cl 5) he divides the superior maxillary horizontally into two separate bones, an upper and a lower, the upper being the 'body' (*hanu-bandhana*), and the lower the alveolar process (*dant-olūkhala*), that is, K and A in Fig 32. It is a difference which indicates a distinct decadence in anatomical knowledge.

5 Ātreya-Charaka's hypothesis of a single, undivided central bone, as reported by Charaka (§ 4), though erroneous, has at least the merit of presenting a consistent view of the structure of the face. In itself, the traditional text of Bheda's report (§ 12) of that hypothesis need not necessarily involve an inconsistency. It makes Ātreya hold three central bones, constituting the nose,

the cheeks, and the brows respectively. On referring to Fig 32, it will be seen that the nasal bones might easily be taken to form a single bone, and the two superciliary ridges, irrespective of the metopic suture, do form a single bone (of the brow, *lalāta*). With respect to the two malai bones (including the 'body' of the superior maxillary) there would be some difficulty by reason of the nasal aperture, still, the extension of the bones downwards being undefined, they might, at a pinch, be taken to constitute a single bone. But, as has been shown in § 13, cl 4, Bheda's account of the system of Ātreya cannot be correct, because it works out the incorrect total 362, instead of 360. It is probable, therefore, that the traditional text of that account is corrupted, and that the genuine list of Bheda agreed with that of Charaka in counting a single undivided central bone of the face. In confirmation of this view the curious fact should be noted that the traditional text of the list of Bheda substitutes the term *hanu-kūta*, lit. prominence of the jaw, for the term *ganda-kūta*, prominence of the cheek, in order to indicate the malai bone. It has been pointed out above that in Ātreya's view of the structure of the face the 'body' of the superior maxillary forms an extension of the malai bones. Hence, in itself, the malai prominence might be correctly described by either of the two terms, *ganda-kūta*, prominence of the cheek, or *hanu-kūta*, prominence of the (upper) jaw. But the difficulty is that the system of Ātreya knows no more than one *hanu*, and that that *hanu* is the inferior maxillary (see § 65), while the term *hanu-kūta* would introduce a reference to the superior maxillary, and thus be inconsistent with the system of Ātreya. For this reason it is practically certain that the word *hanu-kūta* in the traditional text of Bheda is a false reading for *ganda-kūta*. The case of the Non-medical Version of the system of Ātreya is still more unsatisfactory. That version counts four central bones in the place of the single central bone of Charaka, viz. one each for the nose, brows, cheeks, and eyes (§ 16, also § 17, cl 4). Referring again to Figure 32, it may be seen that that count represents an impossible view of the structure of the face. The brows, or superciliary ridges, as above explained, do, indeed, form a single bone, so might the two nasal bones, and the two malai bones,

but how the two eyes (or eyeballs) should form but a single bone is not conceivable. This only proves how little the system of Atreya was understood by the author of the Non-medical Version, and how deficient was his knowledge of anatomy—a circumstance, however, hardly surprising in a writer who was not an expert in medicine but in law.

6 The system presented in the Atharva Veda (§ 43) agrees in the main with that of Ātreya-Charaka. The central facial bone of the latter system appears in the Atharva Veda divided into two portions, an upper and a lower. The upper portion consists of the two superciliary ridges, and is called *lalāta*, or the brow. The lower portion comprises the body of the superior maxillary together with the malai and nasal bones, and is called *kaṭāṅkā*.

§ 67. *The Hard Palate*

1 *Tālu*, palate, *tālūsaka*, palatal cavity. The former term is used by Suśruta (§ 27) and Vāgbhata (37). The latter is peculiar to the system of Ātreya, and is found in the lists of Charaka (§ 4) and Bheda (§ 12) as well as in its Non-medical Version (§ 16).

2 Both Ātreya-Charaka and Suśruta enumerate two palate bones in their lists, but these bones are not identical with what are called the palate bones in modern anatomy. The latter being very small bones, situated in the interior of the skull, do not appear to have been observed as separate bones by the ancient Indian anatomists. The two bones which the latter call palate bones are identical with the so-called palatine process, which is a portion of the superior maxillary bone (Fig. 30). This process consists of halves, which, projecting from either side of the junction of the alveolar process and 'body' of the superior maxillary, meet in the median line, in a ridge or *raphé*, and thus form the roof of the mouth, or what is the major portion of the hard palate¹. These halves of the hard palate form two shallow concavities, and it is these, no doubt, which Atreya-Charaka appropriately denotes by the term *tālūsaka*, or palatal cavity, and which Suśruta, in his class-list of the bones (§ 30) describes as being *kapāla*, or pan-shaped. From this point of view those two medical authorities are quite correct in counting,

¹ See Dr. Grunish's *Textbook of Anatomy*, 2nd ed., pp. 195, 717.

in their lists, two palates (*tālu*) or two palatal concavities (*tālūsaka*) Vāgbhata I, who ignores the median ridge, counts only one palate (*tālu*)

§ 68 *The Teeth and their Sockets*

1 *Danta*, tooth, *dant-olūkhala*, tooth-socket, or *sthāla*, socket, or *sūksma*, minute bone The term *dant-olūkhala* for the socket of a tooth occurs in the Medical Version of the system of Ātreya, as reported by Charaka (§ 4) and Bheda (§ 12), and adopted by Vāgbhata I (§ 37), while the other two terms, *sthāla* and *sūksma*, are peculiar to the Non-medical Version (§§ 16, 22, cl 4)

2 The term *dant-olūkhala*, or tooth-socket, denotes the alveolar processes These processes are, in reality, only portions of the maxillary bones, but Ātreya-Charaka, with whom Vāgbhata I agrees, counts them as separate bones—a procedure which affects his general view of the two maxillaries, fully explained in § 65 Suśruta, in consequence of his counting the maxillaries as a pair of single, undivided bones, discards the socket-bones altogether from his list (§ 27) and counts only the teeth

3 With reference to the number of the teeth (*danta*) Ātreya-Charaka and Suśruta agree Both state them correctly to number thirty-two Ātreya-Charaka goes even so far as to count a corresponding number of sockets Accordingly he divides either alveolar process into thirty-two alveoli, each of which is counted, in his list (§ 4), as a separate bone

4 As to the real morphological character of the teeth, the ancient Indian anatomists, of course, were uninformed They took them to be bone, on account, obviously, of their hardness, and probably also of their white appearance, and because they were found to remain in the skull after every vestige of other tissue had disappeared As a matter of fact, they 'resemble compact bone in appearance and in composition',¹ yet in reality they are more closely allied to the hair For both are modifications of a papilla of the outer integument of the body The tooth, 'though intimately connected with the bony skeleton, is really a calcified papilla of the mucous membrane'¹

¹ See Dr Potter's *Compend of Human Anatomy*, p 142, and Dr Gerrish's *Textbook of Anatomy*, 2nd ed, p 723

§ 69 *The Nails*

Nakha, nail The case of the nails is similar to that of the teeth. They, like the teeth, are allied to the hair, being modifications of the cutaneous membrane. The ancient Indian anatomists looked upon the nails as a waste product (*mala*) of the body secreted in the process of growth of the bones. Consistently with this theory, Suśruta excludes the nails from his count of the bones (§ 27). On the other hand, Ātreya, rather inconsistently as the commentator Chakrapāṇidatta indicates (*ante*, p. 35), includes them in his list of bones, and, of course, as all the three versions of his system (Charaka, § 4, Bheda, § 12, Non-medical, §§ 16, 22) state, he counts twenty of them, one for each finger and each toe.

§ 70 *The Eyeballs*

1 *Aksi-kosa*, eyeball The organ denoted by this term is included among the bones only in the system of Suśruta. The system of Ātreya, as reported in the Medical Versions of Charaka (§ 4) and Bheda (§ 12), does not include them, and in this respect it is followed by Vāgbhata I (§ 37). In the Non-medical Version (§ 16), it is true, the eyeballs are included in Ātreya's system, but its testimony cannot avail against that of the Medical Versions, and the probability is that it adopted the eyeballs under the influence of the system of Suśruta (§ 17, cl. 3). But even as regards the latter system, the eyeballs have experienced strange vicissitudes. For they are absent from Suśruta's list in its Traditional Recension (§ 27), though Suśruta explicitly mentions them in his class-list of the bones as well as in other passages of his Compendium. That his list in its genuine form (§ 34) must have included them has been shown in § 30, cl. 4.

2 Suśruta looked upon the sclerotic coat of the eyeball (Fig. 1) as made of cartilage, and as he counted cartilages as tender, or immature bones (*taruna*), he included the two eyeballs among the bones of the skeleton (§ 30). Ātreya-Charaka, on the other hand, excluded them, not because he knew them to be non-cartilaginous, but probably because the prepared skeleton would

ordinarily be deprived of them. As a matter of fact, the sclerotic is not made of cartilage, but of 'connective tissue with elastic fibres',¹ but to the untrained eye the two substances are so nearly alike that the mistake of a primitive anatomist, such as Suśruta, may be easily understood.

§ 71 *The Ears*

1 *Karna*, ear. The organ denoted by this term is included among the bones in the systems of Suśruta (§ 27) and Vāgbhata I (§ 37). The system of Ātreya, in all three presentations, by Charaka (§ 4), Bheda (§ 12), and the Non-medical Version (§§ 16, 22), does not include it, probably for the same reason as caused the exclusion of the eyeballs (§ 70).

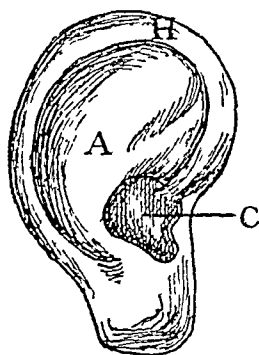


FIG 33

PINNA OF THE RIGHT EAR

Showing—*H* Helix *A* Antihelix *C* Concha

2 Suśruta, who includes the ears among the bones of the skeleton, was doubtless referring to the external ear, the auricle or pinna (Fig 33), which is 'composed almost entirely of yellow fibro-cartilage'.² In his class-list of the bones (§ 30) he explicitly enumerates the ear (*karna*) as an organ made of tender bone (*taruna*), that is, of cartilage. The other two portions of the ear, the middle or tympanum which contains the three auditory ossicles, and the internal or labyrinth, both lying in the interior of the skull, appear, for that reason, to have escaped the notice of the early Indian anatomists.

¹ Dr Potte's *Compend of Human Anatomy*, p 198

² Dr Geirish's *Textbook of Anatomy*, 2nd ed, pp 52, 696

SECTION IV

APPARATUS CRITICUS

A THE SYSTEM OF ĀTREYA-CHARAKA

§ 72 *The Traditional Recension of Charaka*

1 THE subjoined Traditional Recension of the Medical Version of the System of Ātreya in the Compendium of Charaka (*Charaka Samhitā*), *Śāriṅga Sthāna*, VIIth *Adhyāya*, is edited from the following materials

- 1 A = Alwar Palace Library MS, No 1624
- 2 D¹ = Deccan College MS, No 368, fl 30 b, l 4-fl 31 a,
l 3
- 3 D² = Deccan College MS, No 925, fl 107 b, l 8-fl 108 a,
l 4
- 4 IO¹ = India Office MS, No 338, fl 225 b, l 2-fl 226 a,
l 1
- 5 IO² = India Office MS, No 851, fl 71 b, ll 2-13
- 6 T¹ = Tubingen University MS, No 458, fl 324 b, l 5-
fl 325 a, l 6
- 7 T² = Tubingen University MS, No 459, vol II, fl 29 b,
l 3-fl 30 a, l 3
- 8 S¹ = Śāradā MS of D¹ P Cordier
- 9 S² = Śāradā MS of Jammū Library, No 3266, fl 118
- 10 EJ = Edition of Jivānanda, 1877, p 370, ll 5-19

2 It runs as follows

Tatāṅgāyamaśāriṅgasyāṅga-vibhāgaḥ । dvau bāhū dve sakthini śno
grīvamśantatādhnatī sad-angamśangam ॥ Tīni sastāni¹ śatāny-
asthnam saha danta-nakheṇa । tadvyathā । [1] dvātimsad-dan-

¹ So D² T² S² EJ and Chakrapānidatta's commentary IO¹ has sastini, D¹ T¹ sastyanī, S¹ sastya, IO² sastya-adhikāni, A om

tāh, [2] dvātimsād-dant-olūkhalakānī¹, [3] vimśatī-nakhāh,
 [4] śastīh² pānī-pād-anguly-asthīnī, [5] vimśatīh pānī-pāda-
 śalākāh, [6] catvārī pānī-pāda-śalāk-ādhisthānānī, [7] dve pārś-
 nyoī³ asthīnī, [8] catvārīh pādayoī⁴ gulphāh, [9] dvau manīkau⁴
 hastayoh, [10] catvārīy-aiatnyoī⁵ asthīnī, [11] catvārī jan-
 ghayoh, [12] dve jānunī⁶, [13] dve jānu-kapālīke, [14]⁷ dvāv-
 ūīu-nalakau, [15]⁸ dvau bāhu-nalakau, [16 a]⁹ dvāv-amsau,
 [16 b] dve amsa-phalake¹⁰, [17] dvāv-aksakau, [18] ekam¹¹ jatīu,
 [19] dve tālūsake¹², [20] dve śronī-phalake¹³, [21] ekam bhag-
 āsthī, [22] pañcacatvārīmsat-prsthā-gatāny-asthīnī, [23] pañca-
 daśa giivāyām, [24] catuḍaś-oiāsī, [25 a] dvayoh pāśvayōś¹⁴,
 caturvimśatīh paśūkāh¹⁵, [25 b] tāvantī c-aiṇva sthālakānī¹⁶,
 [25 c] tāvantī c-aiṇva sthālak-ārbudānī¹⁷, [26] ekam hanv-asthī,
 [27] dve hanu-mūla-bandhane, [28] ek-āsthī¹⁸ nāsikā-gandakūta-
 lalātam, [29] dvau śankhau, [30] catvārī śīnah-kapālānī¹⁹ ī itī
 tīnī sastānī²⁰ śatāny-asthīnām saha danta-nakhena ||

For the translation, see § 4

¹ So D¹ IO², but T² olūkhalānī, D¹ olūkhalānī, IO¹ T¹ olūkhakānī, A S¹ ² EJ olūkhala-phalānī

² IO¹ prsthā-pāda, T¹ sasti-pāda, with pāda cancelled in both MSS, D¹ sasti-pāda, thus false reading explains Gangādhar's emenda-
 tion, S² om

³ IO¹ pādayoī

⁴ So D¹ IO¹ T¹ S¹ ² EJ, but A D² T² have manibandhakau, IO
 pānikau

⁵ IO² bāhvoī

⁶ IO² jānunoī-dve

⁷ D¹ T¹ prefix dvāv-ūīū

⁸ A T¹ S¹ pref dvau bāhū, IO¹ om No 15

⁹ D¹ om Nos 16a-21

¹⁰ T² skandha-phalake

¹¹ D¹ S¹ EJ evam

¹² A tāluke, T² tālū-phalake

¹³ T¹ om No 20

¹⁴ T¹ D¹ pāśva-sthayōś

¹⁵ So T² and Chakrapānidatta's commentary, D¹ T¹ paryukāh, and
 IO¹ paryuktāh, both obviously corrupt for paśūkāh, D² pāśvakāh,
 A S¹ EJ pārśvavah, obviously wrong for paśavah or pāśvakāh,
 IO² panthakāh, S¹ om

¹⁶ A sthānakā, D² sthānakānī, T² sthānalakānī

¹⁷ A only arbudānī, IO² sthānak-ārbudānī, D² sthānak-ātmakānī

¹⁸ From here missing in A

¹⁹ EJ om the final clause

²⁰ So D², but D¹ IO¹ T¹ sa-sastī, T² sasta

§ 73 *Restored Recension of Charaka*

On the grounds explained in the fifth and sixth paragraphs the true form of the Medical Version of Charaka may be restored as follows

Tatīāyam śaīrasyāṅga-vibhāgūhīdvau bāhū dve saktinī śīo-grīvamśantaiādhiratī sad-angamśangam ॥ Tīni sastāni śātānyasthnam saha danta-nakhena । tadāyathā । [1] dvātīmsādāntātāh, [2] dvātīmsādānt-olūkhalakāni, [3] vimśatīnākhbāh, [4] sastīh pāni-pād-ānguly-asthīni, [5] vimśatīh pāni-pādāśālākāh, [6] catvāri pāni-pādāśālākādhisthānāni, [7] dve pāisnyorasthīni, [8] catvārih pādāyogulphāh, [9] catvāro manikāh¹ hastayoh, [10] catvāryasatnyorasthīni, [11] catvāri jaughayoh, [12] dve jānunī, [13] dve lapālīke², [14] dvāvśūu-nalakau, [15] dvau bāhu-nalakau, [16]³ dve amsa-phalake, [17] dvāvśaksakau, [18]⁴ dve śroni-phalake, [19]⁴ ekam bhag-āsthi, [20]⁵ pañcatvātīmsatprstha-gatānyasthīni, [21]⁶ catvādaśōasi, [22 a]⁶ dvayoh pārsvayōścatu vimśatīh pārsvakāh, [22 b]⁶ tāvanti csaiva sthālakāni, [22 c]⁶ tāvanti csaiva sthālak-ārbudāni, [23] pañcadaśa grīvāyām, [24]⁷ ekam jatīu, [25]⁷ dve tālūsake, [26] ekam hanv-asthi, [27] dve hanu-mūla-bandhane, [28] ek-āsthi nāsikā-gandakūta-lalātam, [29] dvau śankhau, [30] catvāri śīah-kapālāni । itī tīni sastāni śātānyasthnam saha danta-nakhena ॥

For the translation, see § 7

§ 74. *Spurious Recension of Charaka*

1 Gangādhari's spurious recension of the Medical Version of Charaka occurs in the Beihampore edition (1877-8), p 185, l 26-

¹ Trad Rec, dvau manikau

² Trad Rec, jānu-kapālīke

³ Trad Rec inserts dvāvśamsau

⁴ Trad Rec places Nos 18, 19, as Nos 20, 21

⁵ Trad Rec places No. 20 as No 22

⁶ Trad Rec places No 21 and 22 a b c, as Nos 24 and 25 a b c

⁷ Trad Rec places Nos 24, 25, as Nos 18, 19

186, l 22 It is reprinted in the edition of Debendīanāth and Upendīanāth Sen (1897), p 414, §§ 4, 5, and in the second edition of Jīvananda (1896), p 351, §§ 4, 5 It runs as follows

Tatīāyam śāīnasyāṅga-vibhāgāḥ dvau bāhū, dve sakthīnī śno-
gīvam antaiādhīti sad-angam-angam || Tīni sasty-adhikāni
śātānyasthnam saha dant-olūkhala-nakhaḥ tadāyathā [1] dvā-
trīṃśad-dant-olūkhalāni, [2] dvātrīṃśad-dantāḥ, [3] vimśati-
nakhāḥ, [4] vimśatiḥ pāni-pāda-sālākāḥ, [5 a] catvāry-adhīsthā-
nānyāsām, [5 b] catvāni pāni-pāda-pīsthāni,¹ [6] sasti-anguly-
asthīni, [7 a] dve pāṇīnyoh, [7 b] dve kūnc-ādhaḥ, [8] catvāriḥ
pānyor-manikāḥ, [9] catvāriḥ pādāyor-gulphāḥ, [10] catvāry-
aśatnyor-asthīni, [11] catvāni janghayoh, [12] dve jānūnyoh, [13]
dve kūparānyoh, [14] dve ūrvoh, [15] dve bāhvoh, [16] s-
āmsānyoh, [17] dvau aksakau, [18] dve tālunī, [19] dve śīoni-
phalake, [20 a] ekam bhag-asthī, pumsām medhī-asthī, [20 b]
ekam tūka-samsītam, [20 c] ekam gud-asthī, [21] prstha-gatāni
pañcatrīṃśat, [22] pañcadaś-asthīni gīvāyām, [23] dve jatunī,
[24] ekam hanv-asthī, [25] dve hanu-mūla-bandhane, [26 a] dve
lalāte, [26 b] dve aksnoḥ, [26 c] dve gandānyoh, [26 d] nāsikāyām
tīni ghon-ākhyāni, [27 a] dvayoh pāśvayor-catvīvimśatiḥ,
[27 b] catvīvimśatiḥ pañjai-asthīni ca pāśvakāni, [27 c] tāvanti
cāśāṃ sthāḥkānyāśbud-ākāśāni, tāni dvīsaptatiḥ, [28] dvau
sankhakau, [29] catvāni śīrah-kapālāni, [30] vaksasī saptadaśa
iti tīni sasty-adhikāni śātānyasthnamiti ||

For the translation, see § 8

2 The commentary of Gangādharī on the above recension runs as follows, *ibidem*, pp 185-7

Dvau bāhū iti dve ange | dve sakthīnī iti dve ange | śno-
gīvam-ity-ekam-angam | śīrāś-ca gīvā ceti tayoh samābhā-
ity-ekavad-bhāvam | antaiādhīti ekam-angam | antai-madh-
yam-ādadhāt-iti utpattyā madhya-deha iti | ity-evam sad-angam-
angam śāīnam | Suśīute 'py-uktam śāīna-samkhyā-vyākāśanam
Śāīre | tac-ca sad angam śākhāś-catasio, madhyam pañcamam,
sastham śīra iti atīa gīvā-paryantam śīrah-samjñam-iti ||

¹ This clause seems to be based on some false reading like that noticed in § 72, note 2

Trināity-ādi । asthnām sasty-adhikāni śatāni nīnūmāṣīti । nanu śālya-tantīe tiīni śatānyasthnāmātyuktam । kathamāha sasty-adhikāni ityāta āha । sahācety-ādi । śālya-tantīe Suśrute 'pyuktam । tiīni sa-satānyasthi-śatāni veda-vādinō bhāṣante । śālya-tantīesu yeśūmāsthānām viśesena śastīa-kṛtvā cikīṣite nāsti, tāni sasty-asthīni nōpadiśyante । na tu 'na santi' itī kṛtvā nōpadiśyante । tāni ca sastiasthnāmāśā । dant-olūkhala-nakha-jatru-asthīni śastis¹ tāih saba tiīni śatāni bhavantiasthnāmāṣīti । tiīni vivṛnoti ॥

Dvātrīṃśadāity-ādi । dantānām dvātrīṃśat । ekaikasyaikaikamulūkhal-ākṛti-sthiti-sthānamāṣīti dvātrīṃśadāeva dant-olūkhalaṇi । śālya-tantīe nōktāni । dvātrīṃśaddantāśāṣṭāṅgāṣṭad-grihanena tānyāpi grhyante । vimśatīnākhū itī śālya-tantīe nōktam । vimśatīh pāni-pāda-śālākā itī dvayoh pānyoh pādayośca dvayorāśesu catursu sthānesvaṅguli-vimśatermūlesu sthītā vimśatīh śālākāh । sastiāṅguly-asthīni । pāni-pāda-catustaye vimśaterāṅgulīnāmekaikasyāmāṅgulyām tiīni tiīnyasthīni tānyekaikasmin pāni-pāde pañcadaśa, catursu sastiāh । dve asthīni pārsnoh pādayoṣmūle śālākābhyo 'dhahsthamekaikamāṣīti dve । dve kūrādha itī pānyoh śālākābhyo 'dhastātāśāṣṭāṅgāṣṭad-bandha ekaikamāṣīti dvayoh pānyorāśmūle dve asthīni । pārsnyorasthi-vat । tato 'dhastāścatvārih pānyorāmanikā manibandha-sthāne ekaikasmin pānau dve asthīni dvayorāścatvāri । evamāeva pādayoścatvāri gulphā itī । tato 'dhastāścatvāriāratnyorasthīni । hastayoh kosthe tvāekaikasmin dve dve asthīni, tāśāścatvāri āratnyorāṣīti । evam catvāri janghayorasthīni gulphādhastājānu-pariante । dve jānunorāṣīti prthu-gudik-ākāre । evamāeva kūparayorāśasthīni । piakostha-bāhvoh sandhau ksudra-gudik-ākāre dve । dve ūvorātyekaikasmin ūāvāśāścatvāri dve । evamāeva s-āmsayorāśasthīni dve, ekaikasmin bāhāvāścatvāri dve । ityāeva catasru pāni-pāda-rupāsu śākhāsu khalvāścatvāri ekaikasmin śākhāyām nakhaiḥ saba dvātrīṃśadasthīni, catasru tānyastāvīmśaty-uttarām śatam bhavanti । śālya-tantīesu Suśrut-ādīsu nakh-ānuktatvādekaikasyām śākhāyām saptavim-

¹ There appears to be an error here in the print of the commentary. The three items which are mentioned, *dant-olūkhala* (32), *nakha* (20), and *jatru* (2), work out a total, not of 60, but only of 54.

śatih, tānyast-ottara-śatamuktāni । iti dantolūkhala-danta-sahitāni tānyastāvimsaty-uttara-śat-āsthini dvinaaty-adhika-śatam bhavanti । dvāvaksakāvity-ādī । atia dvitva-piasangād-dve tālunī ityuktam । tālu-gata-dvaya-varjamaksak-ādīsu khalvaksakaśioni-bhaga-medhra-tika-guda-prsthesu dvācatvārimśat । tad-yathā । dvāvaksakau kanthādho 'msakau dvau । dve śioni-phalake iti nitambe dve । strīnām ekam bhag-āsthi, pumsām medhi-āsthi, tikam samsrtam ekam, gude caikamiti pañca śionyāmaksakau dvāviti sapta, prstha-gatāni pañcatrimśadīti dvācatvārimśat । atha grīvām pratyūrdhvam saptatrimśadīti । tad-yathā । dve tālunī ityuktam । pañcadaśa grīvāyāmīti । tesāmekādaśa grīvāyām, kanthanādyām catvāni । dve jatunī । Nemeh śalya-tantie vainite । hanv-asthi caikam na vainitamīti । dve hanu-mūla-bandhane । dve lalāte । dve aksnoh । dve gandayoh । nāsikāyām tīnīti ghana-rūpa-vat । iti vaksyati । śīrah-kapālāni catvāri, dvau śankhakāvīti jatū-gata-dvaya-varjam pañcatrimśadgrīvām pratyūrdhvam । atha madhya-dehe । dvayoh pāśvavayorīty-ādī । dvayoh pāśvavayorikaikasmin pāśvaka-mūle vaksasi lagnāni dvādaśa dvādaśa itī catu vimśatih । catu vimśatih pañjai-āsthini pāśvakāni । tānyekaikasmin pāśve dvādaśa dvādaśeti caturvimśatih । tāvanti caisām sthālikāni prsthe tvābud-ākāiāni dvādaśa dvādaśeti catu vimśatis-tāni mīlītvā dvīsaptatih । vaksasi saptadaśeti । pūivam dve jatunī ityuktam ity-ek-ādhika-navatir-madhya-dehe ॥ dvau śankhakau catvāni śīrah-kapālānīti grīvām pratyūrdhvam sad vyākhyātāni itī mīlītvā sasty-adhikāni tīni śātānyasthnam bhavanti । tatia śalya-tantiesu dantolūkhalāni dvātrimśadvimśatīnakhā jatunī dve hanv-asthi caikamīti prthanznoeyante¹ । danta-grahanena dantolūkhalānām grahanāt । nakhānām bāhyatvāt । jatunī dvayovaksaso 'sthi-grahanena grahanāt । hanv-asthnāśca yau-vane prthaktvābhād-dvītvamīti na virodhah ॥

§ 75 *The Glosses of Chakrapānidatta*

The glosses of Chakrapānidatta are edited from the following materials

¹ See the preceding note. This clause seems to involve a similar error, for the four items 32 + 20 + 2 + 1 give a total 55, but not 60

1 T = Tübingen MS, No 463 (vol II), ffs 284 b, 285 a

2 C = Copy of the osteological statement, as contained in the manuscript in Dr P Cordier's possession (see § 11, footnote 1), kindly supplied by him to me

They run as follows

Tatā ayamaty-ādī śno-gūvam-etad-ekam-eva śno-vivaksā-yām | antaīādhn-madhye | sastāni itī sasty-adbhikāni | dant-olū-khalakam yatī-āsītā dantā¹ | yadyapi nakhā Vividhāśitapītiyena mala-bhoga-posyatvena mala eva² priaksiptās-tathāpīh-āsthī-tā³-rūpa-yogasy-āpi vidyamānatvād-asthī-gananāyām pathitāh⁴ | piatyanguli-paiva-trayam tena vimśaty-anguli-gatam-asthnām vimśati-tayam⁵ bhavati | vrddh-āngusthe ca hasta-pāda-priavistam trīyam⁶ paiva jñeyam | vrddh-āngustha-śalākā api svalpa-priamānā jñeyā | angulinām śalākā yatīa samlagnāh tac-chalāk-ādhihsthānam⁷ | jānu jānukam⁸ jangh-orvoh sandhuh | aksakau koth-āvāk amsa-jatīu-sandheh kilakau⁹ | tālūsake tālv-asthinī |

¹ T dant-olūkhakako, C dantes-ūlūkhalam yatī-āsītā dantāh |

² T vividhāśitapītiyena mana-bhoga-posyatvena mana eva, C vividhāśitapītiye mala-bhāga-posyatvena male eva |

³ T āstītā ||

⁴ So T, C has patitāh |

⁵ So C, T reads annām vimśatiyam |

⁶ So T, except that it has va for ca C reads yad-dhasta-pāda-priavistam tat trīyam |

⁷ C tatīa śalāk-āngusthī-ādhihsthānam |

⁸ T om jānu, C om jānukam |

⁹ Conjectural, T has aksakās-kostām-vāmkasayattu sandhe kilakau C reads aksāv-iv-aksakau jatīu-sandheh kilakau | The reading of C conveys the impression of being a conjectural emendation of a corrupt text, perhaps made by the person who copied C for Dr P Cordier. It is clearly not the original reading, for (1) it is so simple and easy that it seems difficult to conceive how a copyist, however ignorant he might be, should transmogrify it into the reading of the Tübingen MS, from which it widely differs, and (2) it involves for the terms *jatru* and *sandhu* the meanings 'collar-bone' and 'connecting-link', which are quite unknown to the older Indian medical science (see § 62). Literally that reading may be translated 'The two axle-like *aksaka* are the pegs of the clavicular connexion', i.e. the two clavicles (*jatru*) which connect (*sandhu*) the neck with the shoulder via pegs (*kīlaka*) resembling the axle of a car which connects its wheels with one another and hence are called 'little axles' (*aksaka*, diminutive of *akṣa*). In the older Indian Medicine, *jatru* means the windpipe or neck, and *sandhu* denotes an articulation. See my article in the *Journal of the Royal Asiatic Society* for 1906, pp 922 ff

bhag-āsthī abhimukham katī-sandhāna-kārikam¹ tīyag-asthī
sthālakānī itī parśukānām mūla-sthānānī nimnānī² | sthālak-
ābudānī tu parśuk-āsthīsu nimnesu madhye sthītāny³ ābud-
ākārāny-asthīnī | nāsikā-gandakūta-lalātānāmītvā⁴ ekam-eva
asthī gananiyam | ye⁵ tu prthag-angānī⁶ pathantī tesām nāsā-
gandakūta-lalātānām tīyānām tīny-eva asthīnī itī na⁷ sankhyā-
pūjanam ||

For the translation, see § 11

§ 76 *The Traditional Recension of Bheda*

The traditional recension of the Medical Version of Ātreya's system in the Compendium of Bheda (*Śāstra Sthāna*, VII *adhyāya*) is edited from the following sources

1 The copy of the Tanjore Manuscript which, as stated in § 12, is my possession. It is a beautifully written copy in Telugu characters, carefully collated with the original manuscript by Mr C Krishnayya, the Tanjore Palace Librarian

2 A copy, in Roman characters, of the osteological statement, kindly made for me by Professor Jolly, from the copy of the Tanjore manuscript in the possession of Dr P Coidier (marked J)

3 An edited copy, in Roman, of the same statement, kindly supplied to me by Dr P Coidier from his copy of the Tanjore manuscript (marked C)

Seeing that the Bheda manuscript is unique and very difficult of access, the osteological statement is first reproduced exactly as it stands in my excellent copy. This reproduction is followed by an amended copy, edited from the sources mentioned above. A translation of it is given in § 12

¹ So C, but T reads atisukham kāya-sandhāna-kārikam |

² So T, but C reads mūla-sthāna-laguṇānī |

³ So T, but C reads only parśuka-mūlāny |

⁴ So T, but C has lalātānām-eka-mūlatvād, which reading yields exactly the same sense

⁵ T om ye |

⁶ So C, but T prthag-gananāt |

⁷ So T, but C has ekatvena tu for itī na, which yields the same meaning

1 *Reproduction*

Trīni sastīni¹ śāvāny²asthām³ tad-yathā | dvātrīṃśad~~ś~~damtāh |
dvātrīṃśad~~ś~~damt-olūkhalakāni⁴ | vimśati pāni-pāda-śālānāny~~ś~~
amguly-asthīni vimśati⁵ | pāni-pāda-śālākā catvāri | pāni-pāda-
śālāk-ādhisthānāni dve⁶ | pāisoi⁶asthīni catvārah | pādayo~~ś~~
gulbah⁷ dvau mānikau pānike dve hastayoh catvāry~~ś~~amśayor⁸
asthīni dve jamghayor~~ś~~dve jānuni⁹ dve jānu-kapānike¹⁰ dvāv~~ś~~
ūū dvāv~~ś~~ūū-naśakau¹¹ dvāv~~ś~~asau¹² dve ansa-phalake¹³ dvāv~~ś~~
amksanau¹⁴ ekam jatru (जतृ)¹⁵ dve tālū¹⁶ dve cubuke dve śioni-
phalake | ekam bhag-asthī | pamcācatvārimśat~~ś~~prstha-gat-odhrs-
thiti¹⁷ pamcadaśa grīvāyām | caturdaś~~ś~~orasi | catūvimśati¹⁸ pāi-
śālā¹⁹ | pārśvayor²⁰yāvamti c~~ś~~aiva sthālākāni tāvamti c~~ś~~aiva
sthālāk-ārbudakāni²¹ | ekam hanv-asthī dve hanu-bandhane²² |
ekam nās-asthī tathā hanukūta-lāti²³ | catvāri śūisa-kapālāni ||

2 *Edition*

Trīni sastīni śatāny~~ś~~asthnām | tad-yathā | [1] dvātrīṃśad~~ś~~
dantāh, [2] dvātrīṃśad~~ś~~dant-olūkhalakāni, [3] vimśati~~ś~~nakhāh²⁴,
[4] sasty²⁴anguly-asthīni, [5] vimśati~~ś~~pāni-pāda-śālākāh, [6]

¹ J C sastīni

² So also J, but C śatāny

³ J C asthnām

⁴ So also C, but J olūkhalāni

⁵ So the three preceding clauses also in J, but C edits them as follows ' vimśati~~ś~~pāni-pāda-śālākāh | anguly-asthīni | catvāri pāni-pāda-śālāk-ādhisthānāni | '

⁶ C pārśnyor

⁷ C gulphāh

⁸ C aratnyor

⁹ C jānuni

¹⁰ C kapālīke

¹¹ So also J, but C nalakau

¹² J dvau nasau, but C dvāv~~ś~~amsau

¹³ J anna-phalake, but C amsa-phalake

¹⁴ J amksanau, but C aksakāv~~ś~~

¹⁵ J jatru, C jatrū

¹⁶ J tālu

¹⁷ So also J, but C gatāny~~ś~~asthīni

¹⁸ J C caturvimśati

¹⁹ So also J, but C pārśvakāni

²⁰ J pārśvayo

²¹ So also C, but J ārbudāni

²² So also J, but C hanu-mūla-bandhane

²³ J lāt, but C lālātām

²⁴ These two words are omitted in the original by a confused blunder of the scribe

catvāri pāni-pāda-śalāk-ādhiṣṭhānāni, [7] dve pārsnyorasthinī,
 [8] catvāriḥ pādayor-gulphāḥ, [9] dvau manikau¹ hastayoh,
 [10] catvāryamatnyorasthinī, [11] dve janghayoh, [12] dve
 jānunī, [13] dve jānu-kapālike, [14] ²dvāvūru-nalakau, [15]
 deest, [16 a] dvāvamsau, [16 b] dve amsa-phalake, [17] dvāv-
 aksakau³, [18] ekam jatiu, [19] dve tālunī¹, [20] dve śvroni-
 phalake, [21] ekam bhag-āsthī, [22] pañcacatvārimśatprstha-
 gatānyasthinī³, [23] pañcadaśa grīvāyām, [24] catudaśorasi,
 [25 a] catuvimsatīḥ pāśvakāḥ, [25 b] pāśvayor-yāvanti
 cāiva sthālākāni, [25 c] tāvanti cāiva sthālāk-ārbudāni, [26]
 ekam hanv-asthī, [27] dve hanu-mūla-bandhane, [28 a] ekam
 nās-āsthī, [28 b] tathā hanukūta-lalāte, [29] deest, [30] catvāri
 śīṣa-kapālāni ||

§ 77 *The Non-medical Version of Yājñavalkya*

The traditional recension of the Non-medical Version of
 Ātreya's System in the Law-book of Yājñavalkya is edited from
 the following sources

- 1 ASB¹ = Asiatic Society of Bengal, No I B 51
- 2 ASB² = " " " No II A 10
- 3 ASB³ = " " " No II A 11
- 4 Bd = Bodleian MS, No 65
- 5 Bl = Berlin MS, No 340 (Prof Stenzler's A, p 132)
- 6 IO¹ = India Office, No 1079
- 7 IO² = " " No 1176
- 8 IO³ = " " No 1278
- 9 IO⁴ = " " No 1786
- 10 IO⁵ = " " No 2035
- 11 IO⁶ = " " No 2060
- 12 IO⁷ = " " No 2074
- 13 IO⁸ = " " No 2167

¹ *Pānīke* dve and *dve cubuke*, in the original, are marginal glosses which have got into the text

² *Dvāvūru*, in the original, is an obvious false duplication

³ *Aṃksanau* and *odhrsthi*, in the original, are obvious clerical errors

- 14 IO⁹ = India Office, No 2823
 15 IO¹⁰ = „ „ No 3022
 16 IO¹¹ = „ „ No 23 (50)
 17 St = Prof Stenzler's edition, pp. 89, 90

It runs as follows

Sad~~angāni~~ tath~~āsthnām~~ ca saha sastyā śata-tīayam || 84 ||
 Sthālaih saha catuhsastir~~dantā vai~~, vimśatir~~nakhāh~~ |
 pāni-pāda-śalākāś~~ca~~, tāsām sthāna-catustayam || 85 ||
 Sasty~~angulinām~~, dve pāisnyoi~~gulphesu~~ ca catustayam |
 catvāry~~aratnik-āsthini~~, janghayos~~tāvad~~eva tu || 86 ||
 Dve dve jānu-kapol-o~~uphalak-āmsasamudbhava~~ |
 akṣa-tālūsake śroni~~phalake~~ ca vimirdiśet || 87 ||
 Bhagāsthy~~ekam~~, tathā prsthe catvāi~~mśac~~ca pañca |
 grīvā pañcadaś~~āsthih~~ syāj~~jatriv~~ekam¹ ca, tathā hanuh || 88 ||
 Tan-mūle dve lalāt-ākṣi-gande, nāsā ghan~~āsthi~~kā² |
 pārśvakāh sthālakaih sādham~~abudaiś~~ca dvīsaptatih || 89 ||
 Dvau śankhakau, kapālāni catvāri śirasas~~tathā~~ |
 urah saptadaś~~āsthīti~~ puusasy~~āsthi~~-samgrāhah || 90 ||
 For the translation, see § 16

§ 78 Gangādhara's Recension of the Non-medical Version

Gangādhara's recension of the Non-medical Version, reprinted from his Berhampore edition, pp 187-8, runs as follows, his emendations being shown in italics (Translation in § 18)

Sthālaih saha catuhsastir~~daśanā~~, vimśatir~~nakhāh~~ |
 pāni-pāda-śalākāś~~ca~~, tāsām sthāna-catustayam || 85 or 28 ||
 Sasty~~angulinām~~, dve pāisnyoh, *kūrca-ādho manigulphayoh* |
 catvāry~~aratnyoś~~*ca* āsthīni, janghāyām tad-vad~~eva~~ ca || 86
 or 29 ||

¹ So Bd, Bl, IO¹⁵⁶⁷⁹¹⁰¹¹, but ASB², IO¹², St jatriv~~ekaikam~~, IO⁸ originally had jatriv~~ekaikam~~, but corrected by the same hand to jatriv~~ekam~~ ca, ASB³ jatrivy~~ekam~~, ASB¹ jatriv~~ekam~~, IO⁸ jālikam ca, IO³ om

² ASB¹ nānāmghrināsthikā.

Dve dve jānu-*kūrpar*-oruphalak-āmsasamudbhave ।

aksa-tālūsake śioniphalake caivamādiśet ॥ 87 or 30 ॥

Bhagāsthy~~ekam~~, *trike*, *pāyau*, *prsthe trimśacca pañca ca* ।

giivā pañcadaś-āsthim syāj~~atrv~~*chaikam*, tathā hanoh ॥ 88 or 31 ॥

Tan-mūle dve, lalāt-aksī-gande, nāsā ghan-āsthikā ।

pāśvaka-sthālikāh sārdham~~abudāni~~ dvīsaptatiḥ ॥ 89 or 32 ॥

Dvau śankhakau, kapālāni catvāry~~eva~~ śirasya~~atha~~ ।

uah pañcadaś-āsthī syāt, purusasy~~āsthī~~-samgriahah ॥ 90 or 33 ॥

Ity~~etad~~*eva* Agneya-purāṇe Yājñavalkya-Samhitāyām ca smrtāv~~uktam~~ ॥

This recension is not quite easy to construe so as to work out the required total of 360. The main difficulty lies in the second verse. There may be an error in the text, but taking it as it stands, it would seem that the numeral which is meant to be construed with *manu-gulphayoh* is the subsequent *catvāri*, four, which likewise governs *aratni* and *jangha*. That is to say, 'of wrist-bones and ankle-bones there are four, also in the fore-arms, and likewise in the legs'. It would also seem that the dual *pārsnyoh* is meant to indicate, not the two heels of the feet, but the heels (supposed to be) in the hands as well as in the feet (see §§ 32, 50). The meaning of *dve pārsnyoh*, therefore, is 'there are two bones in either of the two sets of heels', that is, there are two heels in the hands and two in the feet, or altogether four heels. This, no doubt, gives the impression of a rather forced interpretation. The more obvious meaning would seem to be, 'there are two bones in the heels (of the feet), and two in the wrists as well as in the ankles', that is to say, there are only two heels, two wrist-bones, and two ankle-bones. But with this, apparently more natural, interpretation, it is impossible to work out satisfactorily the total of Gangādhara's recension. That (as shown in § 19) is only possible with the alternative interpretation. And there is this to be said for the latter interpretation, that, as shown by his reconstruction of Charaka's Medical Version (§§ 8, 23), Gangādhara certainly held the existence of four wrist-bones, as well as four ankle-bones.

As to his doctrine of four heels, he was, no doubt, guided by the Traditional Recension of Suśruta's system (§ 27), and by the system of Vāgbhata I (§ 37)

§ 79 *The Commentary of Aparārka*

The commentary of Aparārka on the Non-medical Version, edited from the India Office MS, No 3022, runs as follows

[Verse 84] Sadzangāni ity-ādīnā manusya-śarīrameva nūūpayati । śīrah pānī pādaū madhya-kāya iti sadzangāni । asthīni ca sasty-adhika-śata-traya-samkhyakāni manusya-śarīram dhārayanti ॥

[Verse 85] uktāmasthi-samkhyāmupapādayitumāha । dantā dvātrimśat । dvātrimśadzeva tesām sthālā-samkhyakānyāyatanāsthīni । evam sa-sthālā¹ dantāsca tuhsastirbhavanti । . । nakhāsca vimśatiḥ । pānyoh pādayoścaṅguli-mūlāni śalākāh tāsca vimśatiḥ । tāsām ca śalākānām sthānamasthi-catustayam । evamast-ottari-asthi-śatam ॥

[Verse 86] ekaikasyāmangulyāmasthi-trayam tataśca sarvāsāmangulinām sastirasthīni । pādayoḥ paścimau bhāgau pāṇīni, tayorasthi-dvayam । jangha-pārsnyoh sandhi-pradeśatvam tad-bahir-avasthitau ekatra pāde gulphau, tataśca pādayoḥ gulphesu catvāryasthīni । aratnirzeva aratnikāh, yady-apyaratniśabdo bāhv-agraha eva vartate tathāpyatra asthi-catustaya-samkhyā-sampatty-aiṭham piyuyyamānah, samagramzeva hastamāha, evamaratnik-asthīni bhavanti । jangha-śabdo 'pi tathairiva samagra-pāda-vacano² 'tra, tataśca janghayorapi catvāryzeva asthīni । eśām catussaptatiḥ । pūrvena ast-ottara-śatena saha dvyaśitam śatam ॥ kim ca ॥

[Verse 87] jānūni jangh-oru-sandhī । kapolau gallau । ūū saktinī, te ca phalak-ākāre । amśau bāhu-mūle, tat-samudbhave । tathā akṣa-tālūsake netra-prāntāsthīni । śroni-phalake janghā-prstha-madhyadeśau । praty-abhidhānam dve dve asthīni । evamvidhayā samkhyayā saha caturnavaty-adhikam śatam ॥ kim ca ॥

¹ MS sa-sthālam

² MS pāde vacano

[Verse 88] bhag-āsthī upasth-āsthy-ekam | prsthe pañcacatvā-
 11mśat | grīvāyām pañcadaśa | jatrūni uro-'msayos-sandhāv-ekam |
 hanuś-cibukam, tad-āpy-ek-āsthī | śaisā tīśastih | pūvayā sam-
 khyayā saha śata-dvayam saptapañcāśad-adhikam || kim cā ||

[Verse 89] tan-mūle dve asthīni | tathā lalāt-āsthy-ekam |
 tath-ākṣayor-dve | gandayor-dve | kapol-ākṣi-madhyā-pradeśau
 gandau | nāsā ghana-samjñaken-āsthīn-āpy-uktā¹ veditavyā | tena
 tad-asthy-ekam || paśūkā vankīyah, tāh sthālakan-arbuda-
 samjñakais-ca asthibhis-sāidham dvāseptati | pūvair-astābhis-
 sāidham-aśitih | pūva-samkhyayā saha sapta-tīśāśad-adhika-
 śata-trayam || kim ca ||

[Verse 90] bhrū-karna-madhyā-pradeśau śankhau | asthīni
 śiras-sambandhīni kapāl-ākāñāni catvāri | | uro vaksas-
 tasya saptadaśa | tatah trayovimśatih | pūva-samkhy-opetā sasty-
 adhikam śata-trayam | esa pūvasasya manusya-śaiñāsya asthī-
 samkhyā-samgrahah ||

Translation

[Verse 84] With the words 'six parts, &c' the author de-
 scribes the human body the head, the two hands, the
 two feet, and the trunk these are the six parts, and the bones,
 which number three hundred and sixty, support the body of
 man

[Verse 85] Detailing the said number of bones the author
 says the teeth (*danta*) are thirty-two, thirty-two are also their
 socket-bones, termed *sthāla*, hence the teeth, together with their
 sockets, amount to sixty-four The nails (*nalha*) number
 twenty The long bones (*śalākā*) form the bases of the fingers
 of the hands and feet, they also number twenty The bases
 (*sthāna*) of the long bones number four² Thus we have alto-
 gether one hundred and eight bones

[Verse 86] In each digit (*angulī*) there are three bones,
 hence in all the digits together there are sixty bones The heels
 (*pāśini*) are the posterior parts of the two feet They contain
 two bones At the place where the leg and heel join there are,
 externally, in each foot, two ankle-bones (*gulpha*), and hence the

¹ MS samjñakenāsthāpukra

² See the Exegetical Note in § 83

ankle-bones of the two feet number four *Aratnikā* is a synonym of *aratni*, forearm though the word 'forearm' (*aratni*) does not really include the arm (*bāhu*), yet here, for the sake of obtaining the number four of the bones, it is employed in that sense [i.e. as including the arms] The author is speaking really of the whole upper limb, hence the bones of the 'forearms' (*aratni*) number four. Similarly the word 'leg' (*jangha*) here signifies the whole lower limb, and hence the bones of the two legs also number four. These items together number seventy, and these, together with the aforementioned one hundred and eight, amount to one hundred and eighty-two bones. Further

[Verse 87] The two knees (*jānu*) are the two joints between the leg and the thigh. By the two *kapola* the two cheeks are meant, and by the two *ūru* the two thighs, which are shaped like boards. The two shoulders (or shoulder-summits, *amsa*) are the bases from which the arms spring. Next, by the two *akṣa-tālāsaka*, the two bones are meant which lie on the edge of the eye. The two hip-blades (*śroni-phalaka*) are the two places between the two lower limbs and the back. Each item consists of two bones. Together with the number (twelve) thus obtained, the total of the bones amounts to one hundred and ninety-four. Further

[Verse 88] The pubic (*bhagāsthī*) or private bone is one. In the back (*prsthā*) there are forty-five bones, in the neck (*grīvā*) fifteen, in the windpipe (*jaṭni*), at the joint of the breast and shoulder, one. *Hanu* signifies the chin, that also consists of one bone. This makes sixty-three bones, and with the aforesaid number (194) the total amounts to two hundred and fifty-seven. Further

[Verse 89] At the back of that bone [i.e. of the chin] there are two bones. Next, the brow contains one bone. Next, in the two eyes, there are two bones, so also there are two in the two *ganda*, by which term the two places intermediate between the cheeks and the eyes are meant. The nose must be understood to be expressed also by the term *ghana*-bone. *Parśuka* denotes the ribs, these, together with their sockets (*sthāḷaka*) and the so-called tubercles (*arbuda*), number seventy-two. With the previous eight bones they amount to eighty, and these,

together with the previously stated number (257), amount to three hundred and thirty-seven Further

[Verse 90] The two temples (*śankha*) are the two places intermediate between the eyebrows and the ears The pan-shaped bones (*kapāla*) which constitute the cranium number four . *Uras* signifies the breast, it contains seventeen bones Hence we have altogether twenty-three, and these, together with the previously numbered (337), amount to a total of three hundred and sixty This makes up the aggregate number of bones of the human skeleton

§ 80 *The Commentary of Vijnāneśvara*

In the *Mitāksharā* commentary of Vijnāneśvara, the passages on the Non-medical Version, edited from the India Office MSS, Nos 1079, 2035, 2060, run as follows

[Verse 84] *Tathāṅgāni sadṛeva kaia-yugmam caiana-yugalamuttamāṅgam gātiāmṛti । asthnām tu sasti-sahitam śata-trayamuparitana-sat-śloka-vakṣyamānamavagantavyam ॥ kim ca ॥*

[Verse 85] *sthālāni danta-mūla-pradeśa-sthānyasthīni dvā-trimśat । tairasaha dvātrīṃśadantāścātuhsastirbhavanti । nakhāḥ kaia-ruhā vimśatiḥ । hasta-pāda-sthītāni śalāk-ākūānyasthīni manubandhasyopari-vartīnyanguli-mūla-sthāni vimśatireva । tesām nakhānām śalāk-asthnām ca sthāna-catustayam dvau caianau kaiau ca । ityevamasthnām catu-uttara-śatam ॥ kim ca ॥*

[Verse 86] *vimśatuṅgulayasātāsāmekaikasya tīni tīni, ityevamanguli-sambaddhānyasthīni sastirbhavanti । pādayoh paścimau bhūgau pāisnī, tayorasthīnī dve । ekaikasmīn pāde gulphau dvāvityevam catursu gulphesu catvāryasthīni । bāhvorāratni-pramānāni catvāryasthīni । janghayośca tāvadṛeva catvāni । ityevam catuhsaptatiḥ ॥ kim ca ॥*

[Verse 87] *jangh-oru-sandhirjānuḥ । kapolo gallaḥ । ūnuḥ sakthi, tat phalakam । amso bhujā-śūnāḥ । aksaḥ karna-netrayor madhye śankhādadhobhāgah । tālūsakam kākudam । śroniḥ ka-*

kudminī, tat phalakam | tesāmṛekaikaśo 'sthinī dve dve vinir-
diśet | ityēvam caturdaśāsthīni bhavanti || kim ca ||

[Verse 88] guhyāsthyaekam | prsthe paścima-bhāge pañca-
catvāriṃśadāsthīni bhavanti | grīvā kandharā, sā pañcadaś-
āsthīḥ syāt | vakso-'msayoh sandhirjatu, prati-jatvṛekaikam |
hanuścibukam, tatṛāpyekamāsthī | ityēvam catuhsastī ||
kim ca ||

[Verse 89] tasya hanoṛmūle 'sthinī dve | lalātam bhālam |
akṣi caksuh | gandah kapol-ākṣayoṛmadhya-pradeśah | tesām
samābhāṇo lalāt-ākṣi-gandam, tatra pratyekamāsthī-yugalam |
nāsā ghana-samjñak-āsthimatī | pāśvakāḥ kaks-ādhabhpradeśa-
sambaddhānyāsthīni, tad-ādharma-bhūtāni sthālakāni, taiḥ sthāla-
kaḥ arbudaśācāsthī-viśesaḥ saha pāśvakā dvīsaptatiḥ | pūrv-
oktāśca navabhiḥ sārddhamṛekāśitūbhavanti || kim ca ||

[Verse 90] bhīū-kainayorṛmadhya-pradeśāvāsthī-viśesau
śāṅkhakau | śirasah sambandhīni catvāri kapālāni | uro vaksah,
tatṣaptadaśāsthīkam | ityēvam trayovimśatiḥ | pūrv-oktāśca
saha sasty-adhīkam śata-tīayamṛityēvam puruṣasyāsthī-sam-
grahah kathitah ||

Translation

[Verse 84] The six parts of the body are the following the
pair of hands, the pair of feet, the head, and the trunk As to
the three hundred and sixty bones, they must be understood to
be detailed in the ensuing six verses, as thus

[Verse 85] The sockets (*sthāla*),¹ i. e. the bones which hold the
roots of the teeth, number thirty-two Together with them the
thirty-two teeth (*danta*) amount to sixty-four The nails (*nakha*)
which grow on the hands [and feet] number twenty The
pencil-like (*śalākā*) bones, occurring in the hands and feet,
situated above the wrist-bones [and ankle-bones] and at the
roots of the digits, number also twenty These nails and long
bones have four places (*sthāna*), namely, the two feet and the
two hands¹ So far, the bones amount to one hundred and
four Further,

[Verse 86] The digits (*anguli*) number twenty, in each of
them there are three bones, thus the bones which make up the
digits amount to sixty The heels (*pārsni*) are the posterior parts

¹ See the Exegetical Note in § 83

of the two feet, their bones number two. In each foot there are two ankle-bones (*gūlpha*), thus in the four ankles there are four bones. The bones of the two arms (*bāhu*), being implied in the term forearm (*aratni*), number four. Those of the two legs (*gangha*) likewise number four. Further,

[Verse 87] The knee (*jānu*) is the joint of the leg and thigh. The term *kapola* signifies the cheek. The thigh (*ūru*) is the broad bone (*phalaka*) of the lower limb. The shoulder (*amsa*) signifies the head of the arm (i.e. the summit of the shoulder). By the term *akṣa* is meant that part which lies below the temple between the ear and the eye. The term *tālāsaka* denotes the hard palate. The hip (*śroni*) is the broad bone (*phalaka*) in the loins. In each of these organs one should recognize two bones. Thus we have altogether fourteen bones. Further,

[Verse 88] The private part (*guhya*) consists of one bone. In the back (*prsthā*), or posterior part of the body, there are forty-five bones. The term *grīvā* signifies the neck, it consists of fifteen bones. The collar-bone (*gātru*) is the junction of breast and shoulder [i.e. head of the arm, or summit of the shoulder see verse 87], either collar-bone contains one bone. The term *hanu* signifies the chin, it also contains one bone. Thus we have altogether sixty-four bones. Further,

[Verse 89] At the back of the chin (*hanu*) there are two bones. The term *lalāta* signifies the brow, *akṣi*, the eye, *ganda*, the spot between the cheek and the eye. The aggregate of these (three organs) is indicated by the compound of the three terms *lalāta*, *akṣi*, *ganda*, each of the three component parts consists of a pair of bones. The nose (*nāsā*) is the bone termed *ghana*. The ribs (*pāśvaka*) are the bones which make up the part of the body situated below the armpits, the sockets (*sthālaka*) are their supporters, with these supporters, and with the peculiar bones termed tubercles (*aribuda*), the ribs number seventy-two. Thus, together with the previously mentioned nine, we have eighty-one bones. Further,

[Verse 90] In the space intermediate between the eyebrow and the ear there are the two peculiar bones termed temples (*śankha*). The pan-shaped bones which constitute the cranium (*śnāh-karāla*) number four. The term *uras* denotes the breast,

it contains seventeen bones Thus we have altogether twenty-three bones, and these, together with all the afore-mentioned, make up the total of three hundred and sixty bones which constitute the skeleton of man

§ 81. *The Commentary of Śūlapānī*

The commentary of Śūlapānī, called Dipakālikā, on the Non-medical Version, edited from the India Office MS, No 1278, runs as follows

[Verse 84] Asthnām¹api sasty-adhikam śata-trayam । tad-vibhāgam²āha

[Verse 85] sthālair³ity-ādi । sthālāni danta-bandha⁴-sthānāni, tair saha dantās⁵-catuhsastih । nakhās⁶-ca vimśatih । pāni-pāda-śālākās⁷-ca vimśatih । tesām hasta-dvayena pāda-dvayena ca sthāna-catustayam । evam ca catu-uttara-śatam⁸-asthīni ॥

[Verse 86] sasty⁹ity-ādi । angulīnām pratyekam trīni trīni ity¹⁰-evam sasti¹¹-asthīni । aratnik¹²-asthīni bāhvoḥ । evam ca catuhsaptatir¹³-asthīni ॥

[Verse 87] dve dve ity-ādi । aksa-samyjñe dve । jānu-samyjñe dve । evam ca catuś¹⁴-asthīni ॥

[Verse 88] bhag¹⁵-asthi ity-ādi । hanuś¹⁶-cibukam । evām catuhsasti¹⁷-asthīni ॥

[Verse 89] tan-mūla ity-ādi । tan-mūle hanu-mūle, dve la-lāte । aksi-gande dve । nāsāyām ca ghan¹⁸-asthikāyām¹⁹-ekam । pāśvākāḥ pañjar²⁰-asthīni, tad-ādihārāḥ sthālāni²¹-arbudaiś²²-ca saha dvīsaptatir²³-bhavati । evam²⁴-ekāśīti²⁵-asthīni ॥

[Verse 90] dvāv²⁶ity-ādi । karna-bhūvor²⁷-madhye dvau śankha-kau । śūasah kapālāni catvāri । urāḥ saptadaśa । evam trayovimśatih । evam puruṣasya asthi-samgrāhaḥ kathitah ॥

Translation

[Verse 84] The number of bones is three hundred and sixty The author states their details

[Verse 85] 'With the sockets,' &c The sockets (*sthāla*) are the fixing places of the teeth Together with these, the teeth number sixty-four The nails (*nakha*) number twenty

¹ MS buddha

² MS hanu

The long bones (*śalākā*) of the hands and feet also number twenty. The bases (*sthāna*) of them [i.e. of the nails], by reason of there being a pair of hands and a pair of feet, are four.¹ Thus (in this verse) the bones amount to one hundred and four.

[Verse 86] 'Sixty,' &c. Each digit (*angulī*) has three bones, thus there are altogether sixty bones. The bones of the fore-arms (*aratnikā*) signify those of the two arms (*bāhu*). Thus (in this verse) there are altogether sixty-four bones.

[Verse 87] 'Two each,' &c. The so-called collar-bones (*aḥṣa*) number two. The so-called knees (*jānu*) number two. Thus (in this verse) there are altogether fourteen bones.

[Verse 88] 'The pubic bone,' &c. By *hanu* is meant the chin. Thus (in this verse) there are altogether sixty-four bones.

[Verse 89] 'At the base of it,' &c. The two bases of it (*tan-mūle*) refer to the bases of the chin. There are two brows (*lalāṭa*), also two each of eyes (*aḥṣi*) and cheeks (*ganḍa*). In the *ghana*-bone, that is, in the nose (*nāsā*), there is one bone. The ribs (*pārśvaka*) are the bones of the (thoracic) cage, together with their sockets (*sthāla*) and tubercles (*arbuda*) they number seventy-two. Thus (in this verse) there are altogether eighty-one bones.

[Verse 90] 'Two,' &c. Between the ears and the eyebrows there are the two temples (*śankha*). The pan-shaped bones (*kapāla*) of the cranium number four. The breast (*uras*) has seventeen bones. Thus (in this verse) the total is twenty-three. Herewith the bones of the skeleton of man have been explained.

§ 82 *The Commentary of Mitrāmśra*

The commentary of Mitrāmśra on the Non-medical Version, edited from the India Office MS, No. 1176, runs as follows.

[Verse 84] Karadvaya-caṇadvaya-śūo-gātrāṇi sad-aṅgāṇi |
asthnam sasti-sahitam śata-trayam sat-śloka²-vaksyamānapīa-
kārena dhārayanti | ॥

¹ See the Exegetical Note in § 83.

² MS ślokyā

[Verse 85] dvātrimśatā sthālairdanta-mūla-pradeśā-sthāir-
asthibhiḥ sahitā dvātrimśad-dantāścatuḥṣastirbhavati । pāni-
pāda-nakhā vimśatiḥ । pāni-pāda-sthā śalākāśtad-ākāṅgyasthīni
ca vimśatirmanibandhasya gulphasya ca puṇo-vartini । tesām
nakhānām śalākānām ca mūla-pradeśa-iūpam sthāna-catustayam
kara-dvayam carana-dvayam¹ ca । ityevamātra catu-adhikam
śatamasthīnām ॥ uktam sthāna-catustayam sv-āsthi-bhinnasya
prasangato 'bhidhānāt, yad-vā nakhānām sthānam śalākā ity-
abhed-ānvayah, catustayatvam² caikaika-hast-ādi-śalākānām
samudāyamabhipretya uktamityavirodhah ॥

[Verse 86] angulinām sastirasthīni, ekaikasyā angulerasthī-
traya-sambandhāt । pārśnyoh pāda-pāścima-bhāgayorasthīni
dve । ekaikasmīn pāde gulphau vāma-daksina-sthau dvau dvāv-
iti catusu gulphesu asthī-catustayam । bāhavo 'ratni-pramānāni
catvāryasthīni । iti catuhsaptatiḥ ॥

[Verse 87] jānūnī jangh-oru-sandhī³ | kapolau gallau | ūru-
phalake sakthīnī | amsau bāhu-mūla etat-samudbhavē | piaty-
ekam dve dve asthīnī | akse karna-netr-āntarāla-deśe | tālūsake
tālu-mūle | śroni-phalake katī | piatyekam dve dve asthīnī | iti
caturdaśāsthīnī ||

[Verse 88] bhaga-padena śisnasya apyupalaksanam tad-asthi
ekam । prsthe pañcavatvārimśadasthīni । grīvā kandharā pañ-
cadaś-asthi-yuktā bhavati । ekamasthimśāsritya jatru, vakso-
'msa-sandhi⁴-dvayam । hanuścibukam syāt । ityevam catuh-
sasthiasthīni ॥

[Veise 89] tasya hanor-mūle dve asthinī laḷāte āksinī⁵,
gande ca kapol-ākṣi⁶-madhya-pradeśe, pratyekam dve । nāsā vā
ghan-aikāsthimati⁷ । paśūkāḥ pañjar-asthīni, sthālaśatad-
dhāra-bhūtaṇaḥasthibhuḥalubda-nāmakaḥasthi-viśeśaiśca saha
dvīsapatati । ity-evam-ekāśtitu-asthnām bhavati ॥

[Verse 90] śāṅkhakau bhṛū-karṇ-āntarāl-āsthinī dvau ।
śīrasaḥ kapālāni catvāri । uraḥ pīṭi saptadaś-āsthinī । ity-evam
trayovimsatīḥ । evam mūlītvā sasty-adhikam śāta-trīyamaṇi puru-
ṣasya manusasya asthī-parimānam ॥

¹ MS. vara-dvayam, om carana-dvayam ² MS catustaye tvam

³ MS sandhuh ⁴ MS vakso samdhū ⁵ MS aksnī

⁶ MS. akṣa.

Translation

[Verse 84] The pair of hands, the pair of feet, the head, and the trunk—these are the six parts of the body. They contain the three hundred and sixty bones which are detailed in the following six verses

[Verse 85] The thirty-two teeth (*danta*), together with their thirty-two sockets (*sthāla*), that is, with the bones which form the basements of the teeth, number sixty-four. The nails (*nakha*) of the hands and feet number twenty. Also the pencil-like long bones (*śalākā*) which are in the hands and feet, and which are situated in front of the wrist and ankle, number twenty. With regard to the nails and long bones, there are four places (*sthāna*) which form their foundations, viz. the pair of hands and the pair of feet. Thus, here (in this verse), the total of the bones is one hundred and four. The 'four places' are named as considered apart from their component bones, on the other hand, since the bases of the nails are identical with the long bones, the fourfoldness of the latter is also mentioned in order to indicate their forming sets in each hand and foot, there is therefore here no incongruity.¹

[Verse 86] In the digits (*anguli*) there are sixty bones, on account of each digit being composed of three bones. In the heels (*pāṇi*), that is, the posterior part of the two feet, there are two bones. In either foot there are two ankle-bones (*gūḍha*), two on the right and two on the left sides, thus there are four bones in the four ankles. The two arms (*bāhu*), being implied in the term 'forearms' (*ayātri*), make up four bones. Thus we have a total of seventy-four bones.

[Verse 87] The two knees (*jānu*) are the two joints between the leg and the thigh. By the two *kapola* are meant the two cheeks. The two broad bones of the thigh (*ūru-phalaka*) refer to the lower limbs. The two shoulders (*amsa*) are the two bases whence the arms spring. Each of these items consists of two bones. By the two *aḥsa* are meant the spaces intermediate between the ear and the eye. By the two *tālūsaka* are meant the

¹ See the Exegetical Note in § 83

two bases of the palate The two broad bones (*phalaka*) of *śroni* are the two hips Each of these items consists of two bones This makes altogether fourteen bones

[Verse 88] The word 'vulva' (*bhaga*) indicates also the penis, it consists of one bone In the back (*prstha*) there are forty-five bones, *gīvā*, or the neck, is made up of fifteen bones By *jatru* are meant the two junctions of breast and shoulder, each consisting of one bone *Hanu* signifies the chin This makes a total of sixty-four bones

[Verse 89] At the back of that chin there are two bones As to the forehead, eye, and *ganda*, that is, the space intermediate between the cheek and the eye, there are two bones in each The nose (*nāsā*) consists of one bone, called also *ghana* The ribs (*parśuka*) are the bones of the (thoracic) cage, together with their sockets (*sthāḷaka*) or supporting bones, and with the peculiar bones called tubercles (*aṭbuda*), they number seventy-two This makes a total of eighty-one bones

[Verse 90] The temples (*śanḥa*), that is, the bones lying between the eyebrow and the ear, number two The pan-shaped bones (*kapāla*) of the cranium number four In the breast (*urak*) there are seventeen bones This makes a total of twenty-three bones Adding up all these we obtain three hundred and sixty as the grand total of the bones of the human body.

§ 83 Exegetical Note

Comparing the commentaries quoted in the preceding paragraphs 79-82, it will be seen that, in verse 85, Aparārka counts a total of 108, while Vijnāneśvara, who is followed by Śūlapāni and Mitrāmīśra, counts only 104 The cause of this difference is that in the text of that verse Aparārka read *tāsām*, of them (feminine), while Vijnāneśvara read *tesām*, of them (masculine) The former form, being the feminine genitive plural, can refer only to the preceding feminine noun *śalākā*, long bone, while the latter form, being the masculine genitive plural, must refer to the preceding masculine noun *nalḥa*, nail Accordingly, Aparārka understands the text to mean 'The nails number

twenty, so also the long bones of the hands and feet (*scī* number twenty), the bases of them (i.e. of the long bones) are four' This interpretation enumerates three different items (1) nails, (2) long bones, (3) bases of long bones. On the other hand, Vijnāneśvara understands the text to mean 'The nails number twenty, so also the long bones of the hands and feet (*scī* number twenty), the bases of them (i.e. of the nails) are four' Seeing that the nails are fixed in the digits, and that the bases of the digits are the long bones of the hands and feet, it follows that the bases of the nails are identical with the long bones of the hands and feet. Hence Vijnāneśvara's interpretation admits only two items, namely (1) nails, (2) long bones or bases of nails. The second item, as Mitrāmīśra explains, may be considered in two ways—either distributively, or in the aggregate. Considered distributively, the long bones number twenty, but considered as aggregates (*samudāya*), they number only four, that is, two hands and two feet. On the other hand, if, with Aparāika, we translate 'bases of the long bones', we obtain, of course, a third item, namely, the carpus and tarsus. The question arises. Which is the correct reading of the text, is it *tāsām* or *tesām*, feminine or masculine? The answer cannot be doubtful. Obviously the correct reading is the feminine *tāsām*, referring to *śalākā*, or the long bones. It is correct for two quite sufficient reasons. (1) with the reading *tesām*, the bones of the carpus and tarsus drop out altogether, (2) with the same reading, the four aggregates of the long bones, that is, really the long bones themselves, are declared to be the bases of the nails, but obviously that is an incongruous view. The nails are fixed on the digits, and the digits are fixed on the long bones. As Aparāika rightly says, 'The long bones are the bases of the digits, and the bases of the long bones are four,' namely, the two carpi of the hands and the two tarsi of the feet. Hence the total of the bones, enumerated in verse 85, is 108, but not 104.

§ 84 *The Non-medical Version in the Institutes of Vishnu*

The recension of the Non-medical Version in the Institutes of Vishnu is edited from the following sources

- 1 ASB¹ = Asiatic Society of Bengal, MS No II A 10
- 2 ASB² = „ „ „ MS No II A 11.
- 3 ASB³ = „ „ „ MS No I B 25
- 4 C¹ = Calcutta, Sanskrit College, MS No 5
- 5 C² = „ „ „ MS No 62
- 6 D¹ = Deccan College, MS No 19
- 7 D² = „ „ MS No 20
- 8 D³ = „ „ MS No 155
- 9 E¹ = Elphinstone College, Bombay, MS No 162
- 10 E² = „ „ „ MS No 174
- 11 IO¹ = India Office, MS No 200
- 12 IO² = „ „ MS No 540
- 13 IO³ = „ „ MS No 913
- 14 IO⁴ = „ „ MS No 915
- 15 IO⁵ = „ „ MS No 1545
- 16 IO⁶ = „ „ MS No 1247
- 17 M = Madras, Oriental Library, MS No 87
- 18 Y = Professor Jolly's Edition, pp 196, 197

It runs as follows

॥ 55 । Asthnām tūbhiḥ śataḥ sasty-adhikair-dharyamānam ।
 56 । tesām vibhāgaḥ । 57 sūksmaḥ saha catuḥsasti-daśanāḥ । 58 ।
 vimśatī-nakḥāḥ । 59¹ । pāni-pāda-śalākāś-ca । 60 । sastir-angulinām
 parivāni । 61 । dve pāṇinyoh । 62 । catustayam gulphesu । 63 । cat-
 vāryaratnyoh । 64 । catvāry-anghayoh । 65 । dve dve jānu-kapo-
 layoh² । 66¹ । ūv-amsayoh । 67 । akṣa-tālūśaka-śronīphalakesu ।
 68³ । bhag-āsthy-ekam । 69 । prsth-āsthī pañcacatvārimśad-bhāgam

¹ C¹ IO³ read No 59, dvau bāhūdaka (or taka) -dvayam, IO² M, dve bāhū dve paibāhū ūru-dvayam Also all four omit No 66 ASB¹ also omits No 66, though it has No 59

² IO² kapālayoh

³ C¹ IO³ read No 68 evam adbhah, E¹ reads bhagākhekaḥ prsthā-khekam

170 | pañcadaśāsthīnī grīvā | 71¹ | jativṛekam | 72 | tathā hanuh |
 73 | tan-mūle ca dve | 74² | dve lalāt-ākṣi-gande | 75³ | nāsā ghan-
 āsthikā | 76 | arbudaṇi sthālakaśca sāidham dvāsaptatīḥ pārs-
 vakāḥ | 77⁴ | uraḥ saptadaśa | 78 | dvau śāṅkhakau | 79 | catvāṁ
 kapālāni śūrasāśceti ||

Translation

155 | The body is sustained by three hundred and sixty bones
 156 | Their detail is as follows | 57 | Together with the
 minute (sockets) there are sixty-four teeth (*daśana*) | 58 | The
 nails number twenty | 59 | So also the long bones of the hands
 and feet (number twenty) | 60 | In the digits there are sixty
 joints | 61 | There are two bones in the two heels, | 62 |
 Four, in the ankles, | 63 | Four, in the two forearms, | 64 |
 Four, in the two legs, | 65 | Two each, in the knees and
 elbows, | 66 | And in the thighs and shoulders, | 67 | And in
 the collar-bones, palate, and hip-blades | 68 | There is one
 pubic bone | 69 | The backbone consists of forty-five parts
 70 | The neck has fifteen bones | 71 | The windpipe has
 one bone, | 72 | So also the chin. | 73 | Its bases number
 two | 74 | So do the brows, eyes, and cheeks | 75 | The
 nose consists of the *ghana*-bone | 76 | Together with the tu-
 bercles and sockets the ribs number seventy-two | 77 | The
 breast has seventeen bones | 78 | There are two temples
 79 | And there are four pan-shaped bones in the cranium

§ 85 The Commentary of Nanda Pandita

The commentary of Nanda Pandita, called *Vayayantī*, is
 edited from the following manuscripts

1 ASB³ = Asiatic Society of Bengal, No I B 25

2 C² = Calcutta Sanskrit College, No 62

3 E² = Elphinstone College, Bombay, No 174

¹ ASB¹³ jānvṛekam, C¹ jānukam, IO³ jatrakam

² C¹ lalātākṣinī mate IO² lalaksitāṅgate, IO³ lalātākṣinīgate, M
 lalaksiyanigate

³ ASB³ nāsā sthānāsthikā, C¹ nāsāyāmāsthikā, IO² nāsā gramas-
 thikā, IO³ nāsā vāmāsthikā, M nāsā gnamāsthikā

⁴ C¹ etakādakyah, IO² M kā uraḥ, IO³ edakādakyah

4. IO¹ = India Office, No 200

5 IO⁴ = „ „ No 915

6 IO⁶ = „ „ No 1545

It runs as follows

[55] Anga-piṭyanga-samsthītānām sthūla-sūksmānām-asth-
nām tīrṇi śātāni sastiśca samkhyā । taiḥ śailāṃ dhāryate ।
nanvanyānyapyagie gananiyāni, tat-kathamāyam samkhyā,
ityatra āha ॥

[56] vaksyamāno vibhāgas-tesām-eva avadheyo n-ātiriktā-
nām ॥

[57] Sūksmāni danta-mūla-bhūtāny-asthīni sthāl-ākhyāni
dvātiṃśat । tavanta eva tad-utpannā dantāstaiḥ saha catuḥsas-
tibhavanti । sthālāḥ saha catuḥsastu-dantā itī Yoga-smara-
nāt ॥

[58] hasta-pāda-sthā nakhā viṃśatiḥ ॥

[59] kara-pādayoh prsthe śalāk-ākārāny-angulī-mūla-bhūtāni
viṃśatiḥ-eva asthīni ॥

[60] piṭyekaṃ viṃśaty-angulīnām tīrṇi tīrṇi paivāni । ity-
evam sastiḥ paiv-asthīni ॥

[61] pāṇsuh pāṇi-pāda-pāścādbhāgas-tayoḥ-asthīnī dve ॥

[62] gulphau ghutike, janghā-pāda-granthitau ca । piṭyekaṃ
pādayoḥ-dvau dvāv-ity-evam catvāro gulphās-tesu catvāry-
asthīni ॥

[63] aṭatnu-aratnīmān bāhus-tatīa pratyekaṃ dve dve ity-
evam catvāni ॥

[64] janghā janghāvān pādah । tayoh pratyekaṃ dve dve ity-
evam catvāni ॥

[65] jangh-oru-sandhu-jānuḥ । kapolo gandas-tayoh pratyekaṃ
dve dve ity-evam catvāri ॥

[66] ūṇi sakthīni । aṃsau bhuja-śirasī । tayoh pratyekaṃ dve
dve ity-evam catvāni ॥

[67] aksaḥ kaina-netrayoḥ-madhyā-bhavaḥ śankh-ādhibhā-
gaḥ । tālūśakam kākudam । śiṇiphalakam katih । etesu trisv-
api piṭyekaṃ dve dve ity-evam sat ॥

[68] bhagṛ upasthas-tatr-aiḥ-asthīni ॥

[69] prstha-asthī prstha-vamśo 'pi pañcācatvāriṃśad-asthī-
lah ॥

[70] grīvā śīro-dharā । tasyām pañcadaś-asthīni ॥

[71] vakso-'msayoh sandhir-jatiu | tayoh pratyekam-ekaikam-
evam dve jatrūnī ||

[72] hanuś-cibukam | tatī-aiikam-asthī ||

[73] tasyā hanor-mūla-bhūte dve asthīnī ||

[74] lalātam bhālam | aksī caksuh | gandah kapol-āksayor-
madhya-bhāgas-tesām samābhāo lalāt-āksī-gandam | tatra pratyek-
kam dve dve asthīnī ity-evam sat ||

[75] nāsā nāsikā | sā ca ghana-samjñ-aiik-āsthimatī ||

[76] pārśvakāh vankrayah | pratyekam pārśvayos-trayodaśa
trayodaśa itī sadvimśatīh | tāsām vaksasī sandhy-asthīny-arbu-
dāny-ubhayato daśa daśa itī vimśatīh | sannām pārśvakānām
paraspar-ādharatayā ev-āvasthānen-ābud-ānapeksatvāt | tāsām-
eva prsthatah sandhy-asthīnī sthālakā ubhayatas-trayodaśa
itī sadvimśatīr-ity-evam sthālak-ābuda-samhitāh pārśvakā dvī-
saptatīh ||

[77] uro vaksas-tat-saptadaś-āsthīkam ||

[78] bhrū-karnayor-antarvartīnī asthīnī śāṅkhakau dvau ||

[79] śirasas-catvāri kapālāni | ca-kārah samuccatānām-ukta-
samkhyā-pūṇakatva-dyotan-ārthah | itī vibhāga-samāsau ||

Translation

[55] The number of the bones, large and minute, which constitute the major and minor limbs, is three hundred and sixty. They uphold the body. In the following clauses the author shows how they are to be counted.

[56] The details given below refer to them only, and not to any others.

[57] The minute bones (*sūkṣma*) which form the bases of the teeth, and which are called sockets (*sthāla*), number thirty-two. The teeth (*danta*), set in them, number as many. Both together number sixty-four. 'Together with the sockets the teeth number sixty-four'—such is the traditional teaching of the Yogin¹ (see § 77).

[58] The nails (*nakha*), set in the hands and feet, number twenty.

[59] The pencil-like (*śalākā*) bones in the back of the hands and feet, which form the bases of the digits, number twenty.

¹ Yogin is one of the names of Yājñavalkya.

[60] In each of the twenty digits (*anguli*) there are three joints, thus we have sixty joint-bones

[61] The heel (*pāśanti*) is the posterior portion of the hands and feet. Their bones number two

[62] *Gulpha* signifies the two ankles which knit together the leg and the foot. In each foot there are two of these. Thus there are four ankles, and in them there are four bones

[63] *Aratni* signifies the whole arm (*bāhu*) or upper limb, inclusive of the forearm. In each of these there are two bones, hence there are altogether four bones

[64] *Janghā* signifies the whole foot (*pāda*), or lower limb. In each of these there are two bones, hence there are altogether four bones

[65] The knee (*jānu*) is the joint of the leg and thigh. *Aapola* signifies the cheek. In each there are two bones. Hence there are altogether four bones

[66] *Ūru* signifies the thigh, the shoulder (*amsa*) is the head of the arm. In each of these there are two bones. Hence there are altogether four bones

[67] *Akṣa* signifies the lower portion of the temples, situated between the ear and the eye. *Tālūśala* signifies the hard palate, and *śronphalaka*, the hip. In each of these three there are two bones. Hence there are altogether six bones

[68] *Bhaga* signifies the generative organ. In this there is one bone

[69] The back (*prstha*) or vertebral column is composed of forty-five bones

[70] The neck (*grīvā*) is the organ which supports the head. In it there are fifteen bones.

[71] *Jatru* signifies the junction of the breast and the shoulder. In either of the two (junctions) there is one bone. Hence there are two *jatru*, or collar-bones

[72] *Hanu* signifies the chin. In it there is one bone

[73] At the base of the chin (*hanu-mūla*) there are two bones

[74] *Lalāta* signifies the forehead or brow, *akṣi*, the eye, and *ganda*, the part intermediate between the cheek and the eye. Their combination is expressed by the compound term *lalāt-*

ākṣi-gaṇḍa In each of them there are two bones Hence there are altogether six bones

[75] *Nāsā* signifies the nose It is also termed the *ghana*-bone, and it contains one bone

[76] *Pāśāka* signifies the ribs On either of the two sides of the body there are thirteen ribs, that is, altogether twenty-six On either side are ten *arbuda*, or bones which join them to the breast-bone, that is, altogether twenty As to six ribs, they mutually support one another without any reference to any *arbuda* On either side, also, there are thirteen *sthāla*, or bones which connect the ribs with the back-bone, that is, altogether twenty-six In this way, the ribs, together with the *sthāla* and *arbuda*, number seventy-two

[77] *Uras* signifies the breast, that consists of seventeen bones

[78] The temples (*śankha*), or the bones which are situated between the eyebrows and the ears, number two

[79] In the cranium there are four pan-shaped (*kapāla*) bones The object of the word 'and' is to make clear that the bones, when added together, make up the total number (360) previously stated Thus the bones have now been stated both in detail and in the aggregate

§ 86 *The Non-medical Version in the Purāṇas*

The recensions of the Non-medical Version in the Agni Purāṇa, and in the Vishnu Dharmottara Purāṇa are identical The former is edited from (1) IO = India Office MS, No 5 (7) of the Saurindia Mohun Collection, (2) RM = Rajendra Mitra's edition, vol III, pp 308-9 The latter is edited from T = Tübingen University Library MS, M a I 483

They run as follows

Asthnāmātra śatāni syus-trīni sasty-adhikāni ca ¹ || 27 ||

Sūksmaḥ saha catuhsastir-daśanā vimśatir-nakhāḥ |

pāni-pāda-śalākāś-ca tāsām sthāna-catustayam || 28 ||

Sasty-angulīnām dve pāisnyor-gulphesu ca catustayam |

¹ IO, RM read only a half-verse asthi-sasti-śata-tayam

catvāryaṁatnyorāsthīni jaṅghayorśtūvadzeva tu ॥ 29 ॥
 Dve dve jānu-kapol-oruphalak-āmsasamudbhavā 1
 akṣa-tālūśake 1 śroniphalake cānamādiśet ॥ 30 ॥
 Bhag-āsthyāsekam 2 tathā prsthe catvārimśaśca pañcakam 1
 grīvā pañcadaśāsthīni 3 jatrīsekam ca 4 tathā hanuh 5 ॥ 31 ॥
 Tan-mūle dve lalāt-ākṣi-gande nāsā ghan-āsthikā 6 1
 parśukāḥ sthālakaḥ sūrdhamzābudaiśca dvīsaptatiḥ ॥ 32 ॥
 Dve śankhake 7 kapilūni catvāryāzeva śirasasthīni 1
 mah saptadaśāsthīni puruṣasyāsthī-saṁgrahaḥ 8 ॥ 33 ॥

Translation

[Verse 27] There are three hundred and sixty bones

[Verse 28] Together with the minute bones (*śūlakṣma*), the teeth (*daśana*) number sixty-four, the nails (*naḥka*) twenty, so also the long bones (*śalākā*) of the hands and feet, their bases (*sthāna*) are four

[Verse 29] In the digits (*aṅguli*) there are sixty bones, in the two heels (*pāṇini*) two, in the ankles (*gūlpha*) four, in the two forearms (*aratni*) four, also as many in the two legs (*jaṅgha*)

[Verse 30] There are two bones each in the knees (*jānu*), cheeks (*kapola*), thighs (*ūruphalaka*), and shoulder-blades (*amśa-samudbhava*) Also as many are indicated in the collar-bones (*akṣa*), palatal cavities (*tālūśaka*), and hips (*śroni-phalaka*)

[Verse 31] There is one pubic bone (*bhaṅgāsthī*), and there are forty-five bones in the back (*prstha*) The neck (*grīvā*) contains fifteen bones, the windpipe (*jatrū*) one, so also the chin (*hanu*)

[Verse 32] At the base of the chin (*hanu-mūla*) there are two bones, so also in the brows (*lalāṭa*), eyes (*ākṣi*) and cheeks (*ganda*) The nose (*nāsā*) consists of the *ghana*-bone The ribs,

¹ IO sthānopakā, RM sthānāmsake, T akṣi-sthāne katī yoniphalake

² T bhage tvāsekam

³ IO grīvā pañca tathāsthīni, RM grīvāyām ca tathāsthīni, T grīvāyām ca daśāsthīni

⁴ IO, RM jatrūkam ca, T jatrīvāsthyāsekam

⁵ T hanoh

⁶ IO, RM nāsāṅghry-avasthitāḥ, T nāsā-samāsthītā

⁷ T dvau śankhakau

⁸ IO, RM om puruṣasyāsthī-saṁgrahaḥ.

together with their sockets (*sthāla*) and tubercles (*arūda*), number seventy-two

[Verse 33] There are two temples (*śaṅkhaka*); there are also four pan-shaped bones (*kapāla*) in the cranium The breast (*uśa*) contains seventeen bones These are the bones of the human skeleton

§ 87. *The Non-medical Version in the 'Anatomy'*

The recension of the Non-medical Version in the anonymous 'Anatomy' (§ 23), edited from the Tübingen (T) University Library MS, M a I 483 (Catalogue No 167), fol 5 b, runs as follows —

Sad-angāni śarīrāni ।
 sastih śata-trayam cāsthinām । 1 || 127 ||
 Tad-yathā । dvau bāhū dve sakthinī, śiro madhyamaśtu sad-
 angam ॥ sastih śata-trayam cāsthinām 2 ॥
 Dantā dvātrimśad-ākhyātā s-olūkā, vimśatir-nakhā ।
 pāni-pāda-śalākāśca, tāsām sthāna-catustayam ॥ 128 ॥
 Sasty-angulīnām, dve pārsnyor-gulphesu ca catustayam ।
 catvāryaratnik-āsthini, janghāyās-tāvad-eva tu ॥ 129 ॥
 Dvāv-amsāv-amsaphalake dve, hasta-manikāv-ubhau ।
 dvau bāhu-nalakāv-ūru-nalakau, dve ca tāluni 3 ॥ 130 ॥
 Netre dve, jānuni dve ca, dve ca jānu-kapālike ।
 dve śronīphalake, dve ca hanu-mūlasya bandhane 3 ॥ 131 ॥
 Bhage tv-ekam, tathā prsthe catvārimśac-ca pañcakam ।
 grīvāyām ca daś-āsthini, jatr-ekam tu, tathā hanuh ॥ 132 ॥
 Tadvan-mukhe matam nāsā-gandakūta-lalātakam ।
 pārśvakāḥ kaulakāḥ sārddham arbudaśca 4 dvīsaptatih ॥ 133 ॥
 Dvau śaṅkhakau, kapālāni catvāri śirasas-tathā ।
 urah saptadaś-āsthīti 5 purasasy-āsthi-samgrahah ॥ 134 ॥

¹ Two half-verses of the text, respecting the number of skins and muscles, are omitted

² This clause is a commentary in prose on the preceding verse

³ Verses 130 and 131 are a recast of verse 87 of the recension of Yājñavalkya (§ 77)

⁴ MS arbudaśtu

⁵ MS āsthini

Translation

[Verse 127] The bodies consist of six parts . . . , the number of bones is three hundred and sixty

[Commentary] As thus the two upper extremities, the two lower extremities, the head, and the trunk,—these are the six parts The three hundred and sixty bones are as follows

[Verse 128.] The thirty-two teeth (*ḍanta*) are enumerated along with their sockets (*ulūka*), the nails (*nakha*) number twenty, so also the long bones (*śalākā*) of the hands and feet, their bases (*sthāna*) are four

[Verse 129] There are sixty bones in the digits (*anguli*), two in the heels (*pārsu*), and four in the ankles (*gulpha*) There are four bones in the forearms (*aratnikā*), and there are as many in the legs (*janghā*)

[Verse 130] There are two collar-bones (*amśa*), two shoulder-blades (*amśa-phalaka*), two wrist-bones (*manika*) in either hand, two hollow bones of the arm (*bāhu*), two hollow bones of the thigh (*ūru*), and two palates (*tālū*)

[Verse 131] There are two eyes (*netra*), two knee-caps (*jānu*), as well as two elbow-pans (*lapālīkā*), two hip-blades (*śroni-phalaka*), and two tie-bones at the base of the (lower) jaw (*hanu-mūla*)

[Verse 132] There is one bone in the pubes (*bhaga*), also there are forty and five bones in the back (*prsthā*), as well as ten in the neck (*grīvā*) The windpipe (*jaṭru*) consists of one bone, so also the (lower) jaw (*hanu*)

[Verse 133] Likewise in the face there is considered to be one bone consisting of the nose (*nāsā*), the prominences of the cheeks (*gandakūṭa*), and the brows (*lalāṭa*) The ribs (*pārśvika*), together with their sockets (*kaulaka*¹) and tubercles (*aibuda*), number seventy-two

[Verse 134] There are two temples (*śankha*), also there are four pan-shaped (*lapāla*) bones of the cranium The breast (*uras*) consists of seventeen bones This is the aggregate of the bones of man

¹ Probably false reading for *kolaka*, diminutive of *kola*, flank *Kolaka* would mean a small flank, or side-bone, and would be a good term for the transverse process of a vertebra

B THE SYSTEM OF SUŚRUTA

§ 88 *The Traditional Recension of Suśruta's System*

The traditional recension of the System of Suśruta is edited from the following materials

1. A = Alwar Palace Library MS, No 1703
2. B = Benares Sanskrit College MS, No 23 (old No 64)
3. Bd¹ = Bodleian MS, No 1092 (Hultzsch 349)
4. Bd² = „ MS, No 739 (Wilson 290)
5. D¹ = Deccan College MS, No 224
6. D² = „ „ MS, No 466
7. D³ = „ „ MS, No 948
8. D⁴ = „ „ MS, No 949
9. D⁵ = „ „ MS, No 956
10. IO¹ = India Office MS, No 72 b (Cat No 2645)
11. IO² = „ „ MS, No 1842 (Cat No 2646)
12. EG = Edition of Madhusudan Gupta (Calcutta)
13. EJ = „ of Jivānanda (Calcutta)
14. EM = „ of Madras
15. EP = „ of Piabhuram Jivanaiam (Bombay)
16. CD = Commentary of Dallana
17. CG = „ of Gayadāsa

It runs as follows

Tīṇi sa-sastāny¹ asthi-śātāni veda-vādīno bhāsante । śalya-
tāntre tu² trīṇyeva śātāni³ । tesām sa-vimśam⁴ asthi-śātam
śākhāsu । saptadaśottaram śātam śīoni-pārśva-prsth-odar-orassu⁵ ।
grīvām⁶ pīaty-ūrdhvam trisastih ।⁷ evamasthnām tīṇi śā-
tāni pūiyante ॥⁸ Ekaikasyām tu pād-āṅgulyām tīṇi trīṇi, tāni
pañcadaśa । tala-kūrca-gulpha⁹-samsūtāni daśa । pāisnyām

¹ So Bd², EJ, EM, EP, but A, EG sa-sastāny, B sa-sastyāny, D⁵ IO² sasty-adhikāni, Bd¹ D⁴ IO¹ only sastāny, D²³ only sasty

² D²³⁴⁶ om tu, D⁵ IO² tantresu

³ B, D¹, D²³⁴ asthi-śātāni

⁴ Bd¹ vimśottaram

⁵ B odorassu, so also originally IO¹, IO² reads śīoni-prstha-pāiśv-
oio-ksassu for oio-'ksesu or pāiśv-āks-orassu

⁶ A grīvāyām

⁷ B, Bd², D¹⁵, IO¹² om this clause

⁸ A prefixes pīthak-pīthag-gananā

⁹ D²³⁴⁵, IO¹ tala-gulpha-kūrca, Bd¹ tala-tāla-kūrca-gulpha

ekam¹ | jaṅghāyām dve² | jānuny-³ekam | ekam-⁴ūn-⁵atī trimśat |
 evam⁶ ⁷ekasmin saktīni bhavanti | eten-⁸etara-saktī⁹ ¹⁰bīhū ca
 vyākhyātau | śronyām pañca, tesām bhaga-guda¹¹-nītambesu
 catvāri, trika-samśritam-¹²ekam | pūśve sattimśat | evam¹³
 ekasmin, dvitīye 'py-¹⁴evam | prsthe trimśat | astāv-¹⁵urasi | dve
 aksaka-samjñe¹⁶ | grīvāyām nava¹⁷ | kanthanādyām catvāri |
 dve hanvoh¹⁸ | dantā¹⁹ dvātiimśat | nūśyām trīni | ekam
 tāluni | ganda-kaina-śankhesv-²⁰ekaikam | sat-²¹śirasi ||

Immediately after the above-given Number-list follows the Class-list as follows

Etāny-¹asthīni pañca-²vidhāni bhavanti | tad-³yathā | kapāla-
 rucaka-taruna-valaya-nalaka-samjñāni | tesām jūnu-kūparā⁴-
 nītam-⁵āmsa-ganda-tālu-śankha-vauksanamadhyā⁶ ⁷-śirassu ka-
 pālāni | daśanāś-⁸tu rucakāḥ | ghrāna-kaina-grīv-⁹aksikośesu taru-
 nāni | pāni-pāda-pārsva-prsthodar-¹⁰orissu¹¹ valayāni | śeśāni
 nalaka-samjñāni ||

For the translation, see §§ 27 and 30

§ 89. *Restored Recension*

The original form of the osteological summary of Suśruta may be restored as follows, differences from the traditional recension being shown in *italics* —

Trīni sa-sastīny-¹asthī-²śatāni vedavādīno bhū-³sante | śalya-
 tantie tu tīny-⁴eva śatāni | tesām vad-⁵uttaram-⁶asthī-⁷śatam śū-
 khāsu | astāv-⁸imśaty-⁹uttaram śatam śroni-pārsva-prsth-¹⁰āms-orissu |
 grīvām praty-¹¹ūrdhvam *satsastih* | evam-¹²asthīnām tīni śatāni
 pūryante || Ekaikasyām tu pād-¹³angulyām tīni trīni, tāni pañca |
 tala-gulpha-kūrca-samśritāni *sapta* | pārsnyām-¹⁴ekam | jaṅghā-

¹ D⁵ ekaikam

² D⁷ dve dve, D¹ jaṅghayor-dve

³ A eva

⁴ A etara-saktīni, Bd¹ etare saktīni

⁵ A, EG, EJ, EP, CD, CG guda-bhaga

⁶ B, D^{2,4} om evam

⁷ B aksa-sarajñe

⁸ A, IO¹, EG, EJ, EM, EP navakam

⁹ B hane, IO² hano

¹⁰ Bd¹ dantantesu

¹¹ So B, IO², but Bd^{1,2} D^{1,3,4,5} IO¹, EG, EJ, EM, EP om kūpara

¹² So B, D¹, but IO^{1,2} om vanksana, while A, Bd^{1,2}, D^{3,4,5}, EG, EJ, EM, EP om vanksanamadhyā

¹³ So B, Bd^{1,2}, D³, IO¹, EG, EJ, EM, EP, but D^{1,2} prsth-odārihsu,
¹⁴ D⁴ IO² prsth-odaresu, D⁵ prsth-odariisu

yām dve | jānuny²ekam | ekam²ūrāv²iti *saptavimśatik* | evam²ekasmin²sakthni bhavanti | eten²etara-sakthi, bāhū ca vyākhyātau | śronyām pañca, tesām bhāga-guda-nītambesu catvāri, trika-samsrītam²ekam | pārśve sattvimśat | evam²ekasmin²dvi²tiye 'py²evam | prsthe trimśat | *saptadaś*²orasi | dve *aksa*²-āmsaje | grīvāyām nava | kanthanādyām catvāri | dve hanvoh | dantā dvātrimśat | nāsāyām trīni | *dve* tāluni | gand-āksikosa-karna-śankhesv²ekaikam | sat²śīrasi ||

Etāny²asthīni pañcā-vidhāni bhavanti | tad-yathā | kapāla-rucaka-taruna-valaya-nalaka-samjñāni | tesām jānu-kūpara-nītam²-āmsaja-ganda-tālu-śankha-vanksanamadhya-śīrassu kapālāni | daśanās²tu rucakāḥ | ghrāna-karna-grīv-āksikośesu taiunāni | pāni-pāda-pārśva-prsth-odar-oīassu valayāni | śesāni nalaka-samjñāni bhavanti ||

For the translation, see §§ 30 and 34

§ 90. The Recension of Gangādhar

Gangādhar's recension of the osteological summary of Suśruta, extracted from his Beihampore edition of the *Caraka Samhitā*, p 188, ll 5-14, runs as follows, differences from the traditional recension being shown in *italics* —

Atha punah Sauśīute śalya-tant²ie tu tīny²eva śatāni | tesām²astottara-śatam śākhāsu | *sadvimśaty*²-uttara-śatam śroni-pārśva-prsth-āk²s-oīahsu | grīvām praty-ūrdhvam *satsastik* | evam²asthnām tīni śatāni pūryante || Ekaikasyām tu pād-āngulyām trīni tīni, tāni pañcadaśa | tala-kūrca-gulpha-samsrītāni *sapta* | pārśvā²ekam | janghāyām dve | jānuny²ekam | ekam²ūrāv²iti *saptavimśatir*²ekasmin sakthni bhavanti | eten²etara-sakthi, bāhū ca vyākhyātau | *tāny*²ast-ottara-śatam²asthnām | śronyām pañca, tesām dve nītambe, guda-bhaga-trika-samsrītam²ekaikam | pārśve sattvimśat | evam²ekasmin²dvi²tiye 'py²evam | prsthe tīmśat | dve aksa-samjñe | *saptadaś*²orasi | grīvāyām²ekādaśa | kanthanādyām catvāri | dve hanvoh | dantā dvātrimśat | nāsāyām tīni | *dve* tāluni | ganda-karna-śankhesv²ekaikam, tāni sat | sat²śīrasi ||

For the translation, see § 35

§ 91. *The Systems of Suśruta in the
Śārīra Padminī*

1 The statement of the system of Suśruta in the *Śārīra Padminī*, and its commentary, edited from a manuscript in the possession of Dr P Coidier, runs as follows

Kīkasam tri-śata-samkhyam¹ athādyanīśśālyā-tantra upayuktam²
ihoktam³

vimśatisśca śatam² apy² adhi-śākham śīoni-pūśva udar-orasi
prsthe || 70 ||

Sapta-yukta-daśa-śatam syāt¹ try-utlar-opari śirodhisu sastih¹
anka-samkalanatas² triśat² ittham pañcadh² ākrti-bhidā punar²
etat || 71 ||

For the translation, see § 36

2 The commentary of Vaidyanātha, called *Padminī Prabodha*, on the above-given statement runs as follows

Śārīre 'sthānam sāra-bhūtatajā tad-vivaranam² āha 'kīkasam'
ity² ādi² | 'kīkasam'² asthi² | 'tri-śata-samkhyam'² āhuh² | 'śālyā-tantra'
upayoga-vaśena śālyā-tantra upayuktatvād² ity² arthah² | tad-
upayuktatā tu granti-āntarājñeyā² | katham tri-śata-samkhyam
bhavati ity² āha 'vimśati²' ity² ādi² | 'adhi-śākham' sarva-śākhusu
'vimśatisśca śatam² api²' | yathā² | pratyekam pād-āṅgulyām trīni
trīni ita pañcadaśa | 30 | tala²-gulpha-kūrca-samsrītāni daśa | 20 | 50 |
jaṅghayor² dve | 4 | 54 | pārsnāv² ekam | 2 | 56 | jūnuny² ekam | 2 |
58 | ūrāv² ekam | 2 | 60 | sakthnoh² sastih² | 120³ || 'śīoni-pūśva
udar-orasi prsthe sapta-yukta-daśa-śatam'² | yathā² | guda-bhagayor²
dve | 2 | nītabayor² dve | 2 | trika-samsrītām² ekam | 1 | śīonyām
pañca | 5 | pārsvayor² dvīsaptatih² | 72 | 77 | prsthe tūmśat² | 30 |
107 | dve akṣa-samsakte | 2 | 109 | astāv² māsī | 8 | 117 || evam
'upari śirodhisu' | grīvām praty-ūrdhvam² 'try-utlar² astih²' |
yathā² | grīvāyām nava | 9 | kanthanādyām catvāri² | 4 | 13 | dve
hanvoh² | 2 | 15 | nāsāyām trīni | 3 | 18 | ekam tāluni² | 1 | 19 | ganda-
karna-śankhes² ekam² | 6 | 25 | sat śūnāsī | 6 | 31 | dvātrimsāda-
dantāh² | 32 | 63 | 'Ittham² anka² samkalanatas² triśat²' | yathā² | 120 |
117 | 63 | 300 ||

¹ Short by two instants

² MS om tala

³ See Note below

Note In the original manuscript, the clauses, which refer to the first aggregate 120, run as follows

yathā | piatyekam pād-āṅgulyām trīni tīni iti pañcadaśa | 30 |
gulpha-kūrca-samśritāni daśa | 10 | 50 | janghayor-dve | 2 | 52 |
pāśnāv-ekam | 1 | 53 | jānuny-ekam | 1 | 54 | ūāv-ekam | 55 |
sakthnoh sastih | 60 | 115 | guda-bhagayor-dve | 2 | 117 | nitam-
bayor-dve | 2 | 119 | trika-samśritam-ekam | 1 | 120 ||

Obviously this reading is quite absurd, and must be due to some ignorant copyist who failed to recognize the accidental misplacement of the three clauses *guda-bhagayor-dve*, *nitambayor-dve*, and *trika-samśritam-ekam*, which should not precede, but follow the clause *śroni-pārśva*, &c

Translation

Because of the conciseness of the statement of the bones of the body, he makes the comment which begins with *līkasa*, &c 'Kīkasa, or the bones of the skeleton, number three hundred', this is said on the authority of the count in surgical text-books, for this is meant by the phrase 'in accordance with the count in the Surgical Text-book' But that count itself must be learned from treatises other (than the *Śārīra Padmīnī*) In order to explain how the number three hundred arises, he goes on to say '*vimśati*, or twenty, &c' '*Adhiśākhā*, or in all the limbs together,' there are one hundred and twenty bones As thus in each digit of the foot there are three, making fifteen (1 e 30 in both feet), in the sole, ankle, and cluster there are altogether ten (1 e 20 in both feet, hence together 50) In the legs there are two (1 e 4 in both legs, hence together 54) In the heel there is one (1 e 2 in both heels, hence together 56) In the knee there is one (1 e 2 in both knees, hence together 58) In the thigh there is one (1 e 2 in both thighs, hence together 60) In either of the lower limbs there are sixty (1 e altogether 120) 'In the hips, sides, abdomen, breast, and back, there are one hundred and seventeen bones' As thus In the anus and pubes there are two, in the hips, two, in the sacrum, one, hence in the pelvis there are together five In the two sides there are seventy-two (1 e together 77), in the back there are thirty (1 e together 107), two are contained in the collar-bones

(1 e together 109), in the breast there are eight (1 e together 117) Further, 'above in the *śirodhī*, or head-holders,' that is, from the neck upwards, there are sixty-three bones As thus in the neck there are nine in the windpipe, four (1 e together 13) in the jaws, two (1 e together 15), in the nose, three (1 e together 18), in the palate one (1 e together 19), in either cheek, ear, and temple, one (1 e. 6, or altogether 25) in the cranium, six (1 e together 31) The teeth number thirty-two (1 e altogether 63) By adding up all these items we obtain three hundred, as thus, $120 + 117 + 63 = 300$

§ 92 *The Osteological Summary in the Bhāva Prakāśa*

The statement of the osteological system of Suśruta in the *Bhāva Prakāśa*, extracted from the edition of Jivānanda of 1875 (pp 40, 41), runs as follows

Salya-tantre 'sthī-khandānām śata-trayaṃśudāhrtam ।

tānyevātra nigadyante, tesām sthānāni jāni ca ॥

Sa-vimśati-śatam tvasthnam śākhāsu kathitam budhaiḥ ।

pārśvayoh śroni-phalake vaksah-prsth-odaresu ca ॥

Jāniyād-bhisag-etesu śatam saptadaś-ottaram ।

gūvāyām-ūrdhva-gām vidyāsthanām satim tri-samyutam ॥

For the translation, see § 36

C THE SYSTEM OF VĀGBHATA I

§ 93 *The Osteological System of Vāgbhata I*

1 The statement of the osteological system of Vāgbhata I, extracted from the *Astānga Samgraha* (Bombay edition, vol I, p 224, ll 3-13), runs as follows

Trīni sasty-adhikānyasthī-śatāni । tesām catvārimśacchatam
śākhāsu, sa-vimśa-śatam-antarādhai, śatam mūḍhani itī ॥ Tat-
aikākasmin sakthini pañca pāda-nakhāḥ । pratyekam-angulyām
trīnyasthīni, tāni pañcadaśa । pañca pāda-śīlākāḥ । tat-pratiband-
hakam-ekam । dve dve kūrci-gulpha-janghāsu । ekākam pāśni-
jān-ūrusu । sarvāni ca nakh-āsthy-ādīni sakthi-vad-bāhvośca ।

caturvīmśatīḥ paśūkāḥ, tāvantyeva tat-sthālakānyarbudāni
 ca | trīmśatprsthe | astāvūnāsi | ekaikam bhage tūke | nitam-
 bayośca dve | tad-vadaksakāmsāmsaphalakesu | tathā gānda-
 karnaśankhesu jatru-tālunośca | trayodaśa grīvāyām | catvāri
 kanthanādyām | dve hanu-bandhane | dvātīrīmśadantāḥ | tad-
 vadulūkhalāni ca | tīni nāsāyām | satśīrasī ||

2 Immediately after the above-given Number-list follows the Class-list (*ibidem*, ll 13-16), which runs as follows

Tāni jānu-kūpaia¹-nitamb-āmsa-gānda-tālu-śankha-vanksana-
 madhya-śūnassu kapāla-samjñāni | daśanās-tu rucakāḥ | ghrāna-
 kaina-grīv-aksikośesu taiunāni | pāni-pāda-pārśva-prsth-odar-
 oīassu¹ valayāni | śesāni nalakāni | iti nām-ānugat-ākrtīni pañca-
 vidhānyasthāni ||

3 For the translation of the Number-list, see § 37 The Class-list may be translated as follows

Those bones which occur in the knees, elbows, hips, shoulders, cheeks, palate, temples, interiliac space (i.e. sacrum), and cranium are termed pan-shaped. The teeth are sharp bones. Tender bones occur in the nose, ears, neck, and eye-balls. The bones in the hands, feet, sides, back, abdomen, and breast are ornament-shaped. The remaining bones are reed-shaped. These are the five classes of bones which take their names from their shapes.

D MISCELLANEOUS TEXTS



§ 94—*Suśruta and Vāgbhata on the Muscles*

1 The statement of Suśruta on the number of the muscles, in *Śārīra Sthāna*, ch V, cl 33, referred to in § 40, and edited from Bd¹ (fol 21 b), Bd² (fol 20 b), IO² (fol 24 a)², and EJ (p 334), runs as follows

¹ The Bombay edition omits *kūrpaia*, as well as *udara* and *uras*, probably owing to defective manuscripts. The missing items are required by the context, as well as by the fact that the whole passage is obviously a copy from the statement (§ 88) in the Compendium of Suśruta.

² Unfortunately MS IO¹ (fl 18 b) is defective at this point, omitting the whole of the text from JE, p 333, l 11, to p 334, l 11.

Pañca peśī-śatāni bhavanti | tāsām catvāri śatāni śūkhāsu |
kosthe satsastih | grīvām praty-ūrdhvam catustimśat ||

Translation

There are five hundred muscles Four hundred of them are in
the (four) extremities In the trunk there are sixty-six Upwards
from the neck there are thirty-four

2 The statement in the commentary of Dallana, extracted
from Jivānanda's edition, p 578, runs as follows

'Pañca peśī-śatāni' ity-ādi | māms-āvayava-samghātaḥ paras-
param vibhaktah peśī ity-ucyate | Gayī tu 'kosthe sastiḥ | grīvām
praty-ūrdhvam catvārimśad' itī pathati | . | vṛddha-
Vāgbhata 'pi kosthe sastimśev-āha ||

Translation

With reference to 'the five hundred muscles', the compact
mass of flesh, when separated into its several strands, is called
muscle Gayī (or Gayadāsa), however, reads 'in the trunk
there are sixty, from the neck upwards there are forty'
Vāgbhata the elder, also, says that there are sixty in the
trunk.

3 The statement of Vāgbhata I, on the same subject, ex-
tracted from the Bombay edition, vol I, p 225, ll 20, 21, runs
as follows

Pañca peśī-śatāni | tāsām catvāri śatāni śūkhāsu | sastiḥ śantai-
ādhan | catvārimśad-ūrdhvam ||

Translation

There are five hundred muscles Four hundred of them are in
the (four) extremities Sixty there are in the trunk, forty there
are upwards (of it)

§ 95 Statement of Suśruta on Dissection

The statement on dissection in the Compendium of Suśruta,
referred to in § 45, is edited from the following materials

1 Bd¹ = Bodleian MS, No 1092 (Hultzscher 349)

2 Bd² = „ MS, No 739 (Wilson 290)

- 3 IO¹ = India Office MS, No 72 b (Cat No 2645)
 4 IO² = „ „ MS, No 1842 (Cat No 2646)
 5 EG = Edition of Mudhusudana Gupta (Calcutta)
 6 EJ = „ of Jivānanda (1889, pp 335-6)
 7 EP = „ of Piabhuram Jivanaram (Bombay)

It is translated in § 45, and runs as follows.

Tvak-paryantasya dehasya yo 'yam-anga-viniścayah ।

¹śalya-jñānād-²rte ²naisa vainyate 'ngesu kesu-cit ॥ 43 ॥

Tasmān-nihśamsāyam jñānam hantiā śalyasya vāñchatā ³ ।

śodhayitvā ⁴mrtam samyag-dīastavyo 'nga-viniścayah ॥ 44 ॥

Pratyaksato hi yad-drstam śāstīa-drstam ca yad-bhavet ।

⁵samāsatas-tad-ubhayam bhūyo jñāna-vivardhanam ॥ 45 ॥

Tasmāt-samasta-gātiām-a-vis-opahatam-⁶a-dīrgha-vyādhī-pīditam-⁷a-vaśa-śatikam nihsrst-āntīa⁸-puiṣam puiṣam-a-vahantīyām-āpagāyām nibaddham pañjara-stham ⁹muñja-vaikala-kuśa-śan-ādīnām-anyatamena āvestit-āngam¹⁰-a-prakāśe deśe ko-thayet । samyak-prakuthitam c-oddhrtiya tato deham sapta-rātrīād-usīa-bāla-venu-vaikala¹¹-kūcīnām¹²-anyatamena śanaiḥ śanair-avaghrsyā ¹³tvag-ādīn-sarvān-eva vāhy-ābhyantar-ānga-pratyanga-viśeśān-yath-oktān laksayec-caksusā ॥

§ 96 *Suśrūta on Homology*

1 The statement of Suśrūta on homology in *Śārīra Sthāna*, ch VI, cl 29, referred to in § 28, and edited from Bd¹ (fol 26 a), Bd² (fol 25 a), IO¹ (fol 22 b), IO² (fol 30 a), and EJ (p 341), runs as follows

¹ IO¹ (fl 19 b) om verses 43b, 44a, b

² IO² (fl 25 b) jñān oddhrte

³ Bd², IO² jñānam-icchātā śalya-jivīnā

⁴ Bd², IO² dhāvayitvā

⁵ IO¹ samāsena dvayam tatstu tayor-jñāna-vivardhanam, IO² samāgatam dvayam caksu bhūyo-jñāna-vivardhanam

⁶ IO¹ adīrgham-avyādhikam, om avarśaśatikam

⁷ IO¹ inserts ahīnam after pīditam

⁸ So Bd², IO², but EJ, EG nihsrstāntīa, IO¹ nihsrṣyāmbu, om puiṣam, EP nihsrṣṭa-mūtra

⁹ IO¹ pañjar ākhyam

¹⁰ Bd² vestit-ānga-pratyangam

¹¹ Bd² vaikaja

¹² So IO¹, but EJ, EP kūcīnām

¹³ So IO¹, but BD² gharsayan, EG, EJ, EP avagharsayan

Viśesatas~~tu~~ yāni sakthni gulpha-jānu-vitapāni, tāni bāhau
manibandha-kūpara-kaksadhaiāni | yathā vankṣana-vrsanayor¹
antare vitapam~~evam~~ vaksah-kaksayor~~madhye~~ kaksadhaiam ||

Translation

In particular, just as there are in the leg (the three vital spots) ankle-bone, knee-cap, and ischio-pubic arch, so there are in the arm (the three) wrist-bone, elbow-pan, and collar-bone. Just as between the hip-bone and scrotum there is the ischio-pubic arch, so between the breast-bone and the arm-pit there is the clavicular arch.

Suśruta and Vāgbhata on the Eyeball

2 The statement of Suśruta on the eyeball, in the *Uttara Tantra*, ch I, verses 16 b, 17 a, referred to in § 30, and edited from IO² (fol 3 a, v 19 b, 20 a) and EJ (p 659), runs as follows

Tejoja~~l~~-āśritam bāhyam tesv~~anyat~~prīṣit-āśritam |

Medas~~tr~~tīyam patalam~~ś~~śūtam tv~~asthi~~ c~~ū~~param ||

Translation

The outer-one of the protective covers of the pupil consists of a luminous fluid, and the next-one, of flesh. The third is made of fat, and the farther-one, of bone.

In the Summary of Vāgbhata I (*Aṣṭāṅga Samgraha*, *Śāṅkha* *Sthāna*, ch V, vol I, p 223, l 10) the statement is as follows

Bāhyam c~~ā~~śūtam~~agny~~-ambhasī, dvitīyam mūmsam, trtīyam medas~~catur~~tham~~asthi~~ ||

Translation

The outer-one consists of fire and water, the second, of flesh, the third, of fat, the fourth, of bone.

Bhoja on the Nalaka bones

3 The doctrine of Bhoja on the *nalaka*, or reed-like bones, as reported by Dallana (Jiv, p 576) and Gayadāsa (Cambridge

¹ IO² vrsana-vamksanayor

MS, Add 2491, fol 49 a, l 3), and referred to on p 80, runs as follows

Tad-uktam Bhoje ।

Hasta-pād-āṅgulī-tale kūicesu manī-gulphayoh ।

bāhu-janghā-dvaye cāpi jānīyān-nalakāni tu ॥

Translation

In Bhoja's (treatise) this is said 'The bones which are in the digits and flats of the hands and feet, in the clusters, in the wrists and ankles, and also in both the upper and lower limbs,—these one should know to be reed-like'

The manuscripts read *manibandhayoh*, the reading *manī-gulphayoh* is a conjectural emendation, which is suggested by the fact that otherwise the statement of Bhoja would entirely ignore the ankle-bones (*gulpha*), which, as homologues of the wrist-bones (*manī* or *manibandha*), should by parity of reasoning be included in it. The dual of the MS reading would have to be made to refer, not to the two wrists of the hands, but to the couple of organs consisting of the wrists and their homologues, the ankles, respectively—a very forced interpretation. In the term *bāhu-janghā-dvaya*, *bāhu* denotes the whole upper limb, and *janghā*, the whole lower limb, either of which consists of a couple (*dvaya*) of organs arm, forearm, and thigh, leg

Dallana on the Aggregate Ten

4 The statement of Dallana on the aggregate ten, referred to in § 31, and edited from D⁴ (= Deccan College MS, No 949, fol. 54 a), and Jīvānanda's edition, p 576, runs as follows

Tala-kūica¹-gulph-etyādī । kara-pāda-tale² pañca śalākāh ।
tat-prabandhanam-ekam-asthi । dve dve kūica-gulphayoḥ itī
daśa ॥

Translation

As to the phrase 'sole-cluster-ankle', &c, there are five long bones in the sole of the hand and of the foot, and there is a single bone which interlocks them. In each of the clusters

¹ D⁴ om kūica

² So D⁴, Jīv tale pāda-tale

and ankles there are two bones This makes altogether ten bones

Suśruta and Vāgbhata on the Number of Kūrca

5 The statement of Suśruta on the number of *kūrca*, cluster, in the *Śārīra Sthāna*, ch V, cl 10, referred to in § 31, and edited from Bd¹ (fol 18 b), Bd² (fol 18 a), IO¹ (fol 17 a), IO² (fol 21 a), and EJ (p 330), runs as follows

Sat-kūcāḥ 1 te hasta-pāda-grīvā-medhresu 1 ¹ hastayor-dvau, pādāyor dvau, grīvā²-medhrayor-ekaikah ॥

Translation

There are six clusters They occur in the hands, feet, neck, and penis In the two hands there are two, in the two feet there are two, there is one each in the neck and penis

In the Summary of Vāgbhata I (*Śārīra Sthāna*, ch V, vol I, p 223, l 21) the statement is as follows

Sat-kūrca, hasta-pāda-grīvā-medhresu ॥

Suśruta and Vāgbhata on the Number of Ankles, &c

6 The statement of Suśruta on the number of ankle-bones, wrist-bones, and cluster-heads, in the *Śārīra Sthāna*, ch VI, verse 19, referred to in § 31, and edited from Bd¹ (fol 24 a), Bd² (fol 23 b), IO¹ (fol 21 a), IO² (fol 28 a), and EJ (p 338), runs as follows

Gulphau dvau, manibandhau dvau, dve dve kūca-śīrāmsi ca 1
1 uja-karāni jānīyād-astāv-śetāni buddhimān ॥ 19 ॥

Translation

There are two ankle-bones, two wrist-bones, and also two cluster-heads each (in the hands and feet) These eight an experienced (physician) should know to be excitors of disease

In the Summary of Vāgbhata I (*Śārīra Sthāna*, ch VIII, vol I, p 236, l 11) there is the following statement

Gulphau manibandhau stana-mūle ca sad-dvy-angulāni ॥

¹ Bd¹, BD², IO¹ om whole of third clause

² IO² om grīvā

Translation

The two ankle-bones, the two wrist-bones, and the two areolae (lit, bases of the nipples)—these six are of the size of two *angula*, or finger-breadths

§ 97 *Suśruta on the Position of Cluster and Cluster-head*

1 The statement of Suśruta on the position of the cluster and of the cluster-head, in the *Śārnīa Śthāna*, ch VI, cl 28, referred to in § 49, and edited from Bd¹ (fol 25 b), Bd² (fol 24 b), IO¹ (fol 22 a), IO² (fol 29 b), and EJ (p 340), runs as follows

Pādasyāṅgusth-āṅgulyor-madhye kṣipīamṛiti marma | kṣip-rasy-ōparistād-ubhayatah kūicah ¹ | gulpha-sandheṛ-adho 'nubhayatah ² kūica-śīrah ¹ ||

Translation

Between the great toe and the toe next to it, there lies the vital spot, called *kṣipīa*. Upwards of this *kṣipra*, both ways (i.e. externally and internally), there lies the *kūica*, or cluster. Below the ankle-joint, but not both ways, there lies the *kūica-śīrah*, or cluster-head (astragalus)

*Dallana, Gangādhara and Nanda Pandita
on the Collar-bone*

2 The statement of Dallana on the collar-bone, in his Commentary on Suśruta's Compendium, referred to in § 55, extracted from Jīvānanda's edition, pp 663, 665, runs as follows

Aksakah amsa-sandheṛ-uparistād-bhavati || Aksakah amsa-sandheṛ-uparibhāgah ||

Translation

The *akṣaka*, or collar-bone, is located above the shoulder-joint. It is the upper part of the shoulder-joint.

Gangādhara's statement, in his commentary on the Compendium of Charaka, p 187, l 14, is as follows

¹ Bd¹, Bd², EJ kūico nāma, and kūicaśīro nāma

² So IO¹, but IO² adhah ubhayatah, Bd¹, Bd² only ubhayatah

Dvāvaksakau kanthādadhho 'msakau dvau ||

Translation.

The two *aksaka*, or collar-bones, are the shoulder-bones (which lie) below the throat

Nanda Pandita, in his commentary on the Institutes of Vishnu (Professor Jolly's ed., p. 197), has the following statement
Aksah karna-netrayor madhya-bhavaḥ śaukh-ādhibhūgaḥ

Translation.

Aksa is the lower portion of the temple which lies between the eye and the ear

Suśruta and Vāgbhata on the Position of the Scapula and Clavicle

3 The statement of Suśruta on the position of the shoulder-blade and collar-bone, in the *Śāstra Sthāna*, ch. VI, cl. 31, referred to in § 55, and edited from Bd¹ (fol. 26 b), Bd² (fol. 26 a), IO¹ (fol. 23 a), IO² (fol. 32 b), and EJ (p. 342), runs as follows

Prsth-opari prsthavamsam ubhayatas trika-sambaddhe amsaphalake nāma | bāhumūḍha-grīvā-madhye 'msapīṭha-skandha-¹ nibandhanāv amsau nāma ||

Translation

In the upper part of the back, on both sides of the vertebral column, there lie the two so-called shoulder-blades, being of triangular form. Between the head of the arms and the neck, there lie the two so-called collar-bones, connecting the shoulder-seat, or glenoid cavity, with the nape of the neck

The comment of Dallana on the preceding statement, referred to in § 56, and extracted from Jivānanda's edition, p. 588, runs as follows

'Trika-sambaddhe' iti | grīvāyā amsa-dvayasya ca yah samyogah sa trikaḥ | tatra sambaddhe amsaphalake ||

Translation

Regarding the phrase *triika-sambaddha*, trebly joined, the place

¹ Bd¹ bandha

where the two collar-bones connect with the neck, that is the *trika*, and in that place the (two) shoulder-blades are joined

The same statement, as given in the Summary of Vāgbhata I, *Śārṅga Sthāna*, ch VII, vol I, p 234, l 9, referred to in § 56, runs as follows

Prsthavamsamubhayato bāhumūla-sambaddhe amsaphalake |
grīvā-bāhuśiro-madhye 'msapītha-skandha-bandhanāvamsau ||

Translation

On both sides of the vertebral column there are the two shoulder-blades, joined on to the base of the arms. Between the neck and the head of the arms there lie the two collar-bones, connecting the shoulder-seat, or glenoid cavity, with the nape of the neck

Suśruta on the Number of the Scapula and Clavicle

4 The statements of Suśruta on the number of the shoulder-blades and collar-bones, in the *Śārṅga Sthāna*, ch V, cl 34 and ch VI, cl 3, 11, 18, referred to in §§ 55 and 56, and edited from Bd¹ (fols 21 a, 23 a, 23 b, 24 a), Bd² (fols 20 b, 22 a, 22 b, 23 b), IO¹ (fols. 18 b, 21 a), IO² (fols 24 a, 26 b, 27 a, 28 a), and EJ (pp 334, 336-8), runs as follows

(1) Aksak-āmsau¹ prati samantātṣapta || 34 ||

(2) ²Astāvasthi-maimāni || 3 || katika-taruna-nīlamb-āmsaphalaka-śankhāsvasthi-maimāni || 11 ||

(3) Ams-āmsaphalak-āpānga-nīla-manye³ phanau⁴ tathā || 18 ||

Translation

(1) All round about the collar-bones and shoulder-blades there are seven (muscles)

(2) There are eight vital spots in the bones. These are, two each in the *katika-taruna*, the hips, the shoulder-blades, and the temples⁵

¹ Read aksak-āmsajau

² Bd² om this clause

³ Bd¹, Bd², EJ nīle manye

⁴ IO² phane

⁵ The places referred to appear to be the attachment areas of the

(3) There are two (vital spots) each in the collar-bones, shoulder-blades, *apāṅga*, *nīla*, *maṇya*, and *phāna*

Suśruta on Amsakūta

5 The statement of Suśruta on *amsakūta*, in the *Śārīra Sthāna*, ch VI, cl 30, referred to in § 55, and edited from Bd¹ (fol 26 b), Bd² (fol 26 b), IO¹ (fol 23 a), IO² (fol 31 a), and EJ (p 341), runs as follows

*Amsakūtayoradhasatātpārśvoparibhāgayorapalāpau nāma*¹ ||

Translation.

Below the two summits of the shoulder, in the upper part of the two sides (of the thoracic cage) there are two (vital spots) called *Apalāpa*

Suśruta on Amsapīṭha

6 The statement of Suśruta on *amsapīṭha*, in the *Śārīra Sthāna*, ch V, cl 23, referred to in § 55, and edited from Bd¹ (fol 20 b), Bd² (fol 19 b), IO¹ (fol 18 a), IO² (fol 23 a), and EJ (p 332), runs as follows

*Amsapīṭha-guda-bhaga*²-nīlambesu sāmudgāh ||

Translation

There are (two) casket-shaped (joints) (one is) the shoulder-seat (glenoid cavity), (the other is formed by) the anal, pubic, and hip-bones (acetabulum)

Rājamanḍantu and Amarakosa on Bhaga

7 The definition of *bhaga* in the *Rājamanḍantu*, referred to in p. 153, footnote 1, occurs in the Supplement (*pariśiṣṭa*) of that work, chap xviii, verses 43 and 44 (Ānandāśrama ed, p 399), runs as follows

rotator muscles of the thighs about the ischio-pubic arch, of their flexor muscles in the ilium, of the rotator muscles of the arms, and of the temporal muscles of mastication

¹ IO¹² *apālāpau*, om *nāma*

² Bd² *pāda-guda-bhaga*, Bd¹ *pāda-guda* and IO¹ *guda-pāda*, om *bhaga*

Guda-muskadvayormadhye pumsāmangam bhagah smrtah

॥ 43 ॥

. . | yonirbhago vaiāngam syādūpastham smara-mandiram ॥ 44 ॥

Translation

[Verse 43] The member of the male between the anus and the bipartite scrotum is known as *bhaga*

[Verse 44] The vulva is (called) *bhaga*, or *vaiānga* (lit choice part), or *upastha* (underlying), or *smara-mandira* (lit Cupid's shrine)

In the edition, published by Ashu Bodha and Nitya Bodha Bhattacharya (Calcutta, 1899), verse 43 (there numbered 72, p 389) runs as follows

Guda-muskadvayormadhye yo bhāgah sa bhagah smrtah ॥ 72 ॥

That is, That part which lies between the anus and the bipartite scrotum is known as *bhaga*

In this reading there is no explicit mention of the male, but, of course, the reference to it is implied in the mention of the scrotum. The reading of the Ānandāśīrama edition is supported by the Bodleian MS, No 765 (Wilson, 297), fl 106 a, l 2

The teaching of the *Amaraḥosa* on the subject occurs in its Section II, Chapter vi, verse 76 (in Dī R G Bhandarkar's 5th ed, p 150, Bombay, 1896), and runs as follows

Bhagam yonirdvayoh, śīśno medhro mehana-śephasī ॥

Translation

The vulva (*yonir*) has also the other name *bhaga*, and the penis (*śephas*) or urinary organ (*mehana*) is (also called) urethra (*medhra*), and the 'piercer' (*śīśna*)

The manner in which the two words are contrasted is significant

§ 98 *Suśruta and Vāgbhata on Jatru and Grīvā*

1 The statements of Suśruta on *jatru*, windpipe, and *grīvā*, neck, in the *Śārīra Sthāna*, ch VI, cl 4, 32, referred to in § 62

(p 160), and edited from IO¹ (fols 20 a, 23 b, 24 a), IO² (fols 26 b, 33 a, 34 b), and EJ (pp 336, 342, 343), are as follows

(1) Grīvāyām¹ praty-ūrdhvam saptatrimśat || 4 ||

(2) Ata ūrdhvam² ūrdhva-jatru-gatānyanuvyākhyāsyāmah³ |
 tatā kanthanādīmubhayataścatasro dhamanyah | grī-
 vāyāmubhayataścatasrah sirāh . evamsetāni saptatrim-
 śadūrdhva-jatru-gatāni maimāni vyākhyātāni || 32 ||

Translation

(1) In the neck and upwards there are thirty-seven (vital spots)

(2) Now, further on, we shall describe in detail (the vital spots) occurring from the neck upwards. In that region, in the windpipe there are four *dhamanī*, &c, and in the cervical column there are four blood-vessels, &c. Thus, these thirty-seven vital spots which occur from the neck upwards have been described

In the Compendium of Vāgbhata II (*Astānga Hrdaya*, *Śārīra Sthāna*, ch IV, verse 2 a, in 1st ed, vol I, p 592) the first-quoted statement runs as follows

Prsthe caturdaśūrdhvam tu jatrosatrimśat ca sapta ca ||

Translation

In the back there are fourteen (vital spots), but from the neck upwards there are thirty and seven

Suśruta, Vāgbhata, and Mādhava on the Valmīka Disease

2 The statement of Suśruta on the *Valmīka* disease, in the *Nidāna Sthāna*, ch XIII, verses 7, 8, referred to in § 62 (p 161), and edited from IO² (fol 48 b) and EJ (p. 286), runs as follows

Pāni-pāda-tale sandhau grīvāyāmūrdhva-jatruṇi |

granthirvalmikavadyaśca śanāh samupacīyate || 7 ||

¹ EJ grīvām

² IO¹ om. ūrdhvam

³ EJ vyākhyāsyāmah

Toda-kleda-parīdāha-kandūmadbhīr-vranair-vrtah ।
 vyādhū-Valmīka ity-eśa kapha-pitt-ānī-odbhavah ॥ 8 ॥

Translation

An anthill-like swelling which gradually grows up in the palm of the hand, in the sole of the foot, in a joint, in the neck, or anywhere above the windpipe, and which turns into pricking, running, burning, and itching ulcers—such a disease is called *Valmīka*, and is caused by disorders in the phlegm, bile, and all humours

The same statement in the Summary of Vāgbhata I, *Uttara Sthāna*, ch XXXVII, vol II, p 316, l 2, runs as follows.

Pānī-pāda-tale sandhau jatīūrdhvam c-opacīyate ।
 valmīkavac-ḥhanair-granthīḥ tad-vad-bahv-aṇubhīr-mu-
 khaḥ ॥

Rug-dāha-kandū-kled-ādhyair-Valmīko 'sau samasta-jah ॥

Translation

An anthill-like swelling with numerous minute apertures, which gradually grows up in the palm of the hand, in the sole of the foot, in a joint, or anywhere above the neck, and is full of burning and itching discharges—such a disease is called *Valmīka*, and is caused by all (the three) humours

The same statement in the Pathology of Mādhava (*Nidāna*, ch LV, cl 6, ed Jīv, 1901, p 276) runs as follows

Gīv-āmsa-kaksā-kara-pāda-deśe sandhau gale vā tribhū-eva
 dosah ।

Granthīḥ sa valmīka-vad-akrīyānām jātah kramen-aiva gatah
 pravṛddhīḥ ॥

Mukhair-anekair-srutī-toda-vadbhīr-vīsarpa-vat-sarpatī c-on-
 nat-āgrāḥ ।

Valmīkam-āhū-bhīṣajo vikāṁam nispratyanīkam cira-jam
 vīśeśāt ॥ 6 ॥

Translation

An anthill-like swelling, which has arisen from all the three humours (when disordered) in the neck, shoulder, armpit, and flat of the hand or foot, or in a joint, or in the throat, and

which has gradually grown to a size, with numerous raised orifices running and picking, and which spreads like erysipelas—such a disease the physicians call *Valmīla*, especially if it has been neglected and is of long standing.

Suśruta on Ūrdhvajātrū and Jatrūrdhva

3 The use by Suśruta of the terms *ūrdhvajātrū* and *jatrūrdhva*, referred to in § 62 (p 162), is further illustrated by the following two passages. The first occurs in *Sūtra Sthāna*, ch I, cl 5, and, extracted from EJ (p 2), runs as follows

Śālākyaṃ nāma ūrdhvajātrū-gatānām rogānām śravana-nayana-vadana-ghrāṇ-ādi-samsṛitānām vyādhīnām upaśaman-āritam ॥

Translation

(The branch of medical science) called Minor Surgery is concerned with the cure of the diseases seated in the body from the neck upwards, that is, of the maladies affecting the ears, eyes, mouth, nose, and other organs

Chakrapāṇidatta's comment on this passage in the *Bhānumatī* (Calcutta edition, p 20) runs as follows

(1) Jatrū grīvā-mūlam | jātruna ūrdhvaṃ=ūrdhvajātrū ॥

The comment of Dallana, in Jivānanda's edition, p 7, is

(2) Jatrū grīvā-mūlam | anye vakso-'msa-sandhim-āhuh ॥

Translation

(1) The term *jatrū* signifies the base of the neck, hence the term *ūrdhvajātrū* denotes the body from the neck upwards

(2) The term *jatrū* signifies the base of the neck. Others explain it as the joint of breast-bone and collar-bone

The second passage occurs in the *Nidāna Sthāna*, ch I, verse 14, and, edited from IO² (fol 3 a, l 3) and EJ (p 244), runs as follows

Tena bhāṣita-gīt-ādi-viśeso 'bhīpravartate |

ūrdhvajātrū-gatānāṃ rogān-ākaroti ca viśesataḥ ॥ 14 ॥

Translation

By means of it (i.e. the *udāna* or uprising air) speaking, singing, and other functions (such as breathing) are performed, and in particular (when disordered) it causes the diseases which are seated in the body from the neck upwards

The comment of Dallana on the term *ūrdhvajatru* in this passage (Jiv ed, p 459) runs as follows

‘*Ūrdhvajatru-gatān*’ iti nayana-vadana-ghrāṇa-śīlavana-śīrah-samśīyān ||

Translation

The phrase ‘seated in the *ūrdhvajatru*’ refers to those diseases which have their seat in the eyes, mouth, nose, ears, and the cranium

The similar comment of Aṣṭanadatta, also referred to in § 62, occurs in the *Astānga Hṛdaya, Sūtra Sthāna*, ch I, verse 1 (1st ed, vol I, p 368), and runs as follows

Ūrdhvajatru-vikāresu śīro-roga-ādisu

Translation

The phrase ‘in diseases of the *ūrdhvajatru*’ means ‘in diseases which affect the cranium and other parts of the head’

§ 99 *The Śatapatha Brāhmaṇa on the Total Number of Bones*

1 The statement in the *Śatapatha Brāhmaṇa*, X, 5, 4, 12 (Weber’s ed, p 801), on the total number of the bones of the human body, referred to in § 42, cl 1, runs as follows

Ātmā ha tvēvāso ’gnis̥citah | tasyāsthīnyeva pariśritās-
tāh sastiśca tīni ca śatāni bhavanti, sastiśca ha vai trīni ca
śatāni purusasyāsthīni, majjāno yajusmatya istakāsātāh sastiś-
cāiva tīni ca śatāni bhavanti, sastiśca ha vai trīni ca śatāni
purusasya majjāno ’tha || 12 ||

A similar statement occurs, *ibidem*, XII, 3, 2, 3 and 4 (Weber’s ed, p 912), and is as follows

Trīni ca vai śatāni sastiśca samvatsarasya rātrayas, tīni ca
śatāni sastiśca purusasyāsthīnyatra tat-samam | trīni ca

śatāni sastiśca samvatsarasyābhāni, tīni ca śatāni sastiśca purusasya majjāno 'tra tat-samam || 3 || sapta ca vai śatāni vimśatiśca samvatsarasyāho-īātrāni, sapta ca śatāni vimśatiśca purusasyāsthāni ca majjānaś, cātā tat-samam || 4 ||

For a translation of the above two passages, see § 42, cl 2

Suśruta on Marrow

2 The statement of Suśruta on marrow, in *Sūtra Sthāna*, XIV, verse 6 (Jīv, p 48), referred to in § 42, cl 6, runs as follows

Rasād-raktam, tato māmsam, māmsān-medah prajāyate |
medaso 'sthi, tato majjā, majñah śukrasya sambhavah || 6 ||

Translation

From chyle originates blood, from the latter, flesh (muscle), from flesh, fat, from fat, bone, from the latter, marrow from marrow is the origin of semen

There is nothing like this statement in that portion of Charaka's text-book, which was composed by Charaka himself. In the complement of that work made by Dṛdhabala, however, there occurs, in the *Chikitsita Sthāna*, ch XIX, verse 14 (Jīv ed, 1896, p 656), a similar statement, which is based on Vāgbhata I's account of the subject in his *Astānga Samgraha*, *Śārīra Sthāna*, ch VI (ed, vol I, p 231, l 12), and which is quoted by Arunadatta, as Dṛdhabala's statement, in his commentary on Vāgbhata II's *Astānga Hrdaya*, *Śārīra Sthāna*, ch III, verses 62 a and 63 b (1st ed, vol I, p 569). This statement runs as follows

Rasād-raktam, tato māmsam, māmsān-medas, tato 'sthi ca |
asthno majjā, tatah śukram, śukrād-garbhah prajāyate || 14 ||

Translation

From chyle originates blood, from the latter, flesh, from flesh, fat, and from the latter, bone from bone, marrow, from the latter, semen, from semen, the foetus

The further statement of Suśruta, in *Śārīra Sthāna*, ch IV, cl 9 and 10 (Jīv p 319), also referred to in § 42, cl 6, and edited from Bd¹ (fol 11 a), Bd² (fol 11 a), IO¹ (fol 11 b), IO² (fol 14 a), runs as follows

Tṛitīyā medodhaiā nāma, medo hī sarva-bhūtānām-udāra-
sthā, anv-asthisu ca mahatsu ca majjā bhavati ॥ 9 ॥

Sthūl-āsthisu viśesena majjā tv-abhyantar-āsthitaḥ ।

tath-etaresu saivesu sa-īkṣtam meda ucyate ॥

Śuddha-māmsasya yah snehah sā vasā paṇikūṭitā ।

¹ ath-etaresu saivesu sneho medo vibhāvītā ॥ 10 ॥

Translation

The third stratum (*kalā*) is called the fat-bearing, fat exists in the abdomen of all creatures, it also occurs in the small and large bones as marrow. In the large bones particularly, in the cavity of which it is found, it is called marrow. In all other bones it is called bloody fat. The grease which attaches to clean flesh (in the abdomen) is known as suet. In all other cases the fat is denoted simply grease.

The Śatapatha Brāhmaṇa on the Number of Bones in the Head and Trunk

3 The statement in the *Śatapatha Brāhmaṇa*, XII, 2, 4, 9-14 (Weber's ed, p 910), on the number of bones, or portions, of the head and trunk, referred to in § 42, cl 3, and § 62, cl 6, runs as follows

Śira ev-āśya trivrt । tasmāt-tat-tri-vidham bhavati, tvag-asthi mastīskah ॥ 9 ॥ grīvāḥ pañcadaśah । caturdaśa vā etāsām karūka-rāni, vīryam pañcadaśam, tasmād-etābhū-anvībhīḥ satībhī-gurum bhāram hariati, tasmād-grīvāḥ pañcadaśah ॥ 10 ॥ uraḥ saptadaśah । astāv-anya jatravo 'stāv-anya, uraḥ saptadaśam, tasmād-uraḥ saptadaśah ॥ 11 ॥ udaram-ekavimsāḥ । vimśatir-vā antar-udare kuntāpāny-udaram-ekavimsāḥ, tasmād-udaram-ekavimsāḥ ॥ 12 ॥ pāśve trinavah । triyodaś-ānyāḥ parśavas-triyodaś-ānyāḥ, pāśve trinave, tasmāt-pāśve trinavah ॥ 13 ॥ anūkam trayastrimsāḥ । dvātrimśad-vā etasya karūkarāny-anūkam triayastrimsāḥ, tasmād-anūkam trayastrimsāḥ ॥ 14 ॥

For the translation, see § 42, cl 3

¹ The last line is omitted in Bd¹, Bd², IO² and Jivānanda's edition, but it occurs in IO¹ and has the support of Gayadāsa's commentary, Cambridge MS, Add 2491, fol 36 a

The Śatapatha Brāhmaṇa on Costal Cartilages

4 The statement in the *Śatapatha Brāhmaṇa*, VIII, 6, 2, 7 10 (Weber's ed., p. 682), on *jatru*, or the costal cartilages, referred to in §§ 42, cl. 4, 62, cl. 6, runs as follows

Utas-tristubhah | tā 1etahsico1velayopadadhāti, prstayo vai 1etahsiccā, no vai piati prstayah || 7 || paśavo brhatyah | kikasāh kakubhah, so 'ntaena tristubhaśca kakubhaśca brhatīsupadadhāti, tasmādāmā ubhayatra paśavo baddhāh kikasāsu ca jatrusu || 10 ||

For the translation, see § 42, cl. 4

NOTE The osteological terms mentioned in Nos 3 and 4 have been much misunderstood in dictionaries and translations. Considered in the light of Indian anatomical doctrine it is not so difficult to interpret them correctly. *Prsti* is a synonym of *prsthā*, and means back-bone or vertebra. *Kikasa* denotes the transverse processes of the thoracic vertebrae. *Jatru* is a costal cartilage. *Karūhara* is another term for the transverse processes of the cervical and thoracic vertebrae. *Kuntāpa* does not refer to any gland in the abdomen, but to the transverse processes of the lumbar vertebrae. *Udara* does not mean the abdomen simply, but the lower or abdominal portion of the vertebral column, while *anūka* refers to the upper or thoracic portion of that column. The whole vertebral column is divided into three parts *gīrvā*, cervical, *anūka*, thoracic, and *udara*, lumbar. This is practically the same as our modern division. *Vīrya*, vital force, or strength, which is said to be the fifteenth neck-bone, obviously represents the median line of the cervical column, considered as forming a single bone, and imparting to the whole set of neck-bones its peculiar strength by which heavy loads are supported. The osteological principles implied in the use of these terms are explained in § 42, cl. 7 and 8, and in my article on 'Anatomical Terms' in the *Journal of the Royal Asiatic Society* for 1907, pp. 1-18.

§ 100 *The Atharva Veda on the Skeleton*

The hymn on the creation of man in the Atharva Veda, X, 2, verses 1-8, referred to in § 2, cl 4, and § 43, and extracted from the edition of Roth and Whitney, runs as follows

- 1 Kena pāisnī ābhrte pūrusasya, kena māmsam sambhrtam,
kena gulphau ।
ken=āngulīh peśanīh, kena khānī, ken=ochlakhau madhyatah,
kah piatisthām ॥
- 2 Kasmān=nu gulphā=adharā=akr=van=asthī=vantā=uttarau
pūrusasya ।
janghe nurtya nyadadhuh kva svij, jānunoh sandhī ka u tac= ciketa ॥
- 3 Catustayam yujyate samhī=āntam, jānubhyām=ūdhvam
śīthnam kabandham ।
śionī yad=ūū ka u taj=jajāna yābhyām kusindham su-drdham
babhūva ॥
- 4 Katī devāh katame ta āsanya uro gūivāś=ci=kyuh pūrusasya ।
katī stanau vyadadhuh, kah kaphodau, katī skandhān, katī
prstī=ac=ivan ॥
- 5 Ko asya bāhū samabharad= vūyam karāvād=iti ।
amsau ko asya tad=devah kusindhe adhyādadhau ॥
- 6 Kah sapta khānī vi tataida śīsanī, kanā=imau nāsike
caksanī mukham ।
yesām puutrā vijayasya mahmanī catuspādo dvipado yānti
yāmam ॥
- 7 Hanvo=hi jihvām=adadhāt, pu=ūcīm=adhā mahīm=adhi
śīśiāya vācam ।
sa ā vai=aiti bhuvanes=antā=apo vasānah, ka u tac=ciketa ॥
- 8 Mastiskam=asya yatamo lalātam kakātīkām piathamo yah
kapālam ।
citvā cityam hanvoh pūrusasya divam iuioha, katamah sa
devah ॥

For the translation, see § 43, cl 2, also my article in the *Journal of the Royal Asiatic Society* for 1907, pp 10-12

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